

DEPARTMENT OF ENERGY
SCIENCE AND TECHNOLOGY PRIORITIES

HEARING
BEFORE THE
COMMITTEE ON SCIENCE, SPACE, AND
TECHNOLOGY
HOUSE OF REPRESENTATIVES
ONE HUNDRED THIRTEENTH CONGRESS

SECOND SESSION

APRIL 10, 2014

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**DEPARTMENT OF ENERGY
SCIENCE AND TECHNOLOGY PRIORITIES**

THURSDAY, APRIL 10, 2014

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Committee met, pursuant to call, at 9:07 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Lamar Smith [Chairman of the Committee] presiding.

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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Department of Energy Science and Technology Priorities

Thursday, April 10, 2014

9:00 a.m. -- 11:00 a.m.

2318 Rayburn House Office Building

Witness

The Honorable Ernest Moniz, Secretary, U.S. Department of Energy

**U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY**

HEARING CHARTER

Department of Energy Science and Technology Priorities

Thursday, April 10, 2014

9:00 a.m. – 11:00 a.m.

2318 Rayburn House Office Building

PURPOSE

The Committee on Science, Space, and Technology will hold a hearing titled “*Department of Energy Science and Technology Priorities*” on Thursday, April 10, 2014, at 9:00 a.m. in Room 2318 of the Rayburn House Office Building. With the release of the President’s budget request for fiscal year (FY) 2015, the purpose of the hearing is to examine the Department of Energy’s (DOE) science and technology priorities, emphasizing how these factors influence research, development, demonstration and commercialization activities and budgets within the overall mission of the Department.

WITNESS LIST

- **The Honorable Ernest Moniz**, *Secretary of Energy, U.S. Department of Energy*

BACKGROUND

The Department of Energy (DOE) funds a wide range of research, development, demonstration, and commercial application activities. DOE’s primary mission is to “advance the national economic, and energy security of the United States; to promote scientific and technological innovation in support of that mission; and to ensure the environmental cleanup of the national nuclear weapons complex.”¹ In order to fulfill its mission, DOE operations are guided by five strategic themes: energy, nuclear safety and security, scientific discovery and innovation, environmental responsibility, and management and operational excellence.

The President’s FY 2015 budget request for DOE is \$27.9 billion, which represents a \$715.6 million or 2.6 percent increase over FY 2014 omnibus levels.² Approximately one third of this amount is dedicated to programs within the Committee on Science, Space, and Technology’s jurisdiction. The balance of DOE’s funding is primarily allocated to the National Nuclear Security Administration (NNSA) to maintain a stockpile of nuclear materials and Defense and Non-Defense Environmental Management (EM) programs.

¹ All DOE mission statements are cited from that office’s website. See generally www.energy.gov.

² Ibid.

The following table provides a breakdown of the DOE budget request within the Science Committee's jurisdiction:

Department of Energy (DOE) Science and Technology Spending (dollars in millions)				
Program	FY 2013 Enacted	FY 2014 Enacted	FY 2015 Request	FY 2015 vs FY 2014 (% Change)
Office of Science (SC)	4,903.5	5,066.4	5,111.2	0.9%
Advanced Scientific Computing Research	443.6	478.1	541.0	13.2%
Basic Energy Sciences	1,698.4	1,711.9	1,806.5	5.5%
Biological and Environmental Research	613.3	609.7	628.0	3.0%
Fusion Energy Sciences	403.5	504.7	416.0	-17.6%
High Energy Physics	795.7	796.5	744.0	-6.6%
Nuclear Physics	550.7	569.1	593.6	4.3%
Workforce Development for Teachers and Scientists	18.6	26.5	19.5	-26.4%
Science Laboratories Infrastructure	112.5	97.8	79.2	-19.0%
Safeguards and Security	81.1	87.0	94.0	8.0%
Science Program Direction	186.1	185.0	189.4	2.4%
Energy Efficiency and Renewable Energy (EERE)	1,820.7	1,900.6	2,316.7	21.9%
Electricity Delivery and Energy Reliability (OE)	140.0	147.2	180.0	22.2%
Nuclear Energy (NE)	770.1	888.4	863.4	-2.8%
Fossil Energy (NE)	495.0	561.9	475.5	-15.4%
Advanced Research Projects Agency - Energy (ARPA-E)	276.7	280.0	325.0	16.1%
Loan Guarantee Program Office	5.7	26.0	11.0	-57.7%
Total	8,411.5	8,870.6	9,282.8	4.6%

This budget request claims to meet the Administration's goals of funding technological solutions to further their energy and nuclear security goals. While endorsing an all-of-the-above energy strategy, the President's Budget seeks to have "the Nation lead the global effort to combat climate change while creating U.S. jobs." The budget request also pays for environmental cleanup and to secure nuclear and radiological materials around the world.³

Secretary Moniz has also reorganized the management of DOE into three Secretariats — Science and Energy, Nuclear Security, and Management and Performance, each with an Undersecretary in charge. Important questions and key issues to be discussed at the hearing include:

³ Department of Energy, *FY 2015 Budget Request, Budget Highlights*, P. 1, March 2014, Accessible at: <http://www.energy.gov/sites/prod/files/2014/03/f13/f15Highlights%20%281%29.pdf>

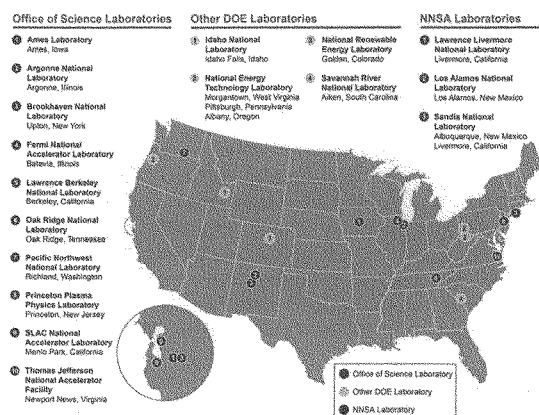
- The role of government when picking winners and losers for companies, types of energy sources, and technologies in the energy sector;
- The Administration's priorities for the development of renewable energy at the expense of basic research; and
- The performance of the DOE loan guarantee program compared to other sources for funding.

DOE R&D PROGRAMS AND OFFICES

Office of Science (SC)

The mission of the Office of Science is “to deliver scientific discoveries and major scientific tools that transform our understanding of nature and advance the energy, economic, and national security of the United States.”⁴ The FY 2015 budget request for the Office of Science (SC) is \$5.1 billion, a \$44.8 million or 0.9 percent increase over the FY 2014 appropriations. Funding for SC is spread across four priority goal areas: 75% for research; 15% for facility operations; 9.6% for future facilities; and 0.4% for workforce development. SC has grown at an annualized 3.7% from 2008 to 2014.

The Office of Science is the largest Federal sponsor of basic research in the physical sciences, and supports 31 national scientific user facilities, many of which are operated by the national labs (see a map of the labs below).⁵ SC supports research programs and user facilities that include support for three Bioenergy Research Centers (BRCs), 46 Energy Frontier Research Centers (EFRCs), and two Energy Innovation Hubs.



⁴ Department of Energy, *FY 2015 Budget Request, Science, Advanced Research Project Agency-Energy*. P. 1, March 2014. Accessible at http://energy.gov/sites/prod/files/2014/04/f14/Volume_4.pdf

⁵ For a list of SC-supported National User Facilities see: U.S. Department of Energy, Office of Science User Facilities, FY 2013. Accessible at: http://science.energy.gov/-/media/ /pdf/user-facilities/Office_of_Science_User_Facilities_FY_2013.pdf

The Office of Science budget and activities are divided into six major program areas:

- **Basic Energy Sciences (BES)** supports fundamental research to understand, predict, and ultimately control matter and energy to provide the foundations for new energy technologies, to mitigate the environmental impacts of energy use, and to support DOE missions in energy, environment, and national security.
- **Biological and Environmental Research (BER)** includes efforts to understand how genomic information is translated to functional capabilities, enabling more confident redesign of microbes and plants for sustainable biofuels production, improved carbon storage, and contaminant bioremediation. BER research advances our understanding of the role of atmospheric, terrestrial, ocean, and subsurface interactions in determining climate dynamics to predict future climate change and plan for future energy and resource needs.
- **Advanced Scientific Computing Research (ASCR)** supports advanced computational research, applied mathematics, computer science, and networking as well as development and operation of multiple, large high performance computing facilities.
- **Fusion Energy Sciences (FES)** supports research to understand the behavior of matter at high temperatures and densities, and to develop fusion as a future energy source.
- **High Energy Physics (HEP)** supports research to understand how the universe works at its most fundamental level by discovering the most elementary constituents of matter and energy, probing the interactions among them, and exploring the basic nature of space and time.
- **Nuclear Physics (NP)** supports research to discover, explore, and understand nuclear matter in a variety of different forms.

Energy Efficiency and Renewable Energy (EERE)

The Office of Energy Efficiency and Renewable Energy (EERE) is “the U.S. Government’s Primary clean energy technology organization” that works to “support high-impact applied research, development, demonstration, and deployment (RD&D) activities.”⁶ The DOE budget for FY 2015 requests \$2.3 billion for EERE, an increase of \$416 million or 22 percent over FY 2014 appropriations levels.

EERE proposes to ensure American leadership in the transition to a clean energy economy through research, development, demonstration and deployment (or RDD&D) in activities in the following areas: sustainable transportation (\$705.2 million), renewable electricity (\$521.3 million), and end-use energy efficiency in buildings and factories (\$857.7 million).

⁶ Department of Energy, *FY 2015 Budget Request, Energy Programs*. P. 11, March 2014, Accessible at <http://energy.gov/sites/prod/files/2014/04/114/Volume%203.pdf>

EERE programs also emphasize cross-cutting initiatives, including: *Grid Integration Initiative*, *Clean Energy Manufacturing Initiative (CEMI)*, *Next Generation Power Electronics Initiative*, *Carbon Fiber Composites for Clean Energy Initiative*. Specific EERE sub-programs include:

- **Bioenergy Technologies.** EERE requests \$253.2 million (9 percent increase) in FY 2015, with an emphasis on the development of innovative processes to convert cellulosic and algal-based feedstocks to bio-based gasoline, jet, and diesel fuels. It proposes commercial scale demonstration for military-specification fuels with the U.S. Departments of Navy and Agriculture.
- **Solar Energy.** EERE requests \$282.3 million (a 9.82 percent increase) in FY 2015 to support the SunShot Initiative goal to make solar power cost competitive without subsidies by 2020. This includes the development and demonstration of manufacturing technologies to increase U.S. competitiveness, in support of DOE's Clean Energy Manufacturing Initiative, and solar photovoltaic activities that enable both hardware development and a 50 percent reduction in non-hardware "soft costs".
- **Water Power.** EERE requests \$62.5 million (a 6.72 percent increase) in FY 2015 to support innovative technologies for generating electricity from water resources. HydroNEXT, a new EERE initiative, aims to improve the performance, flexibility, and environmental sustainability of technologies applicable to existing hydropower facilities, while also developing and demonstrating technologies that will enable new hydropower development.
- **Wind Energy.** EERE requests \$115 million (a 30.49 percent increase) in FY 2015 to fund three advanced offshore wind demonstration projects, as well as an Atmosphere to Electrons Initiative focused on optimizing whole wind farms as a system to lower costs. FY 2015 funding also enables pursuit of new designs, materials and manufacturing processes for longer blades to capture more wind resource and to address energy storage and transmission barriers in support of DOE's Clean Energy Manufacturing Initiative.
- **Hydrogen and Fuel Cell Technologies.** EERE requests \$93 million (a 0.06 percent increase) in FY 2015 to support a focused R&D effort to reduce the cost and increase the durability of fuel cell systems. Hydrogen Fuel R&D proposes to work on technologies and materials that will reduce hydrogen production, compression, transport, and storage costs. The request also proposes to support targeted early market fuel cell demonstrations and addresses codes and standards to overcome barriers to commercialization.
- **Vehicle Technologies Program (VTP).** EERE requests \$359 million (a 23.91 percent increase) in FY 2015 to support RDD&D of efficient and alternative fuel vehicles. A number of vehicle technology goals are planned: battery energy storage, electric drive research and development, and advanced power electronics initiatives in support of the EV

Everywhere Grand Challenge⁷; improvements in lightweight materials performance; more efficient combustion engine technologies; and alternative fuel vehicle community partner projects. The alternative fuel vehicle community partner projects are competitively-awarded to build strategically-placed, high-impact, community-scale demonstrations of alternative fuel vehicles.

- **Geothermal Technologies.** EERE requests \$61.5 million (a 34.35 percent increase) in FY 2015, including support for site characterization of the Frontier Observatory for Research in Geothermal Energy (FORGE). FORGE is a dedicated site that enables testing of technologies and techniques, with a central focus on Enhanced Geothermal Systems optimization and validation.⁸ FY 2015 funding also accelerates “play fairway” analyses, which provide assessments of exploration risk and the probability of finding new resources on a regional scale, resulting in maps and studies that reduce drilling and development risks.
- **Advanced Manufacturing Office (AMO).** EERE requests \$305.1 million (a 69.06 percent increase) in FY 2015 to support the deployment of at least one additional Clean Energy Manufacturing Innovation Institute, along with continued support of existing institutes. The FY 2015 funding request also seeks to support high-impact R&D focused on advanced manufacturing and materials that will enable U.S. manufacturers to realize significant gains in energy productivity, environmental performance, product yield, and economic competitiveness. The request also plans to support high-impact R&D focused on advanced manufacturing and materials with U.S. manufacturers to realize significant gains in energy productivity, environmental performance, and product yield.
- **Building Technologies** EERE requests \$211.7 million (a 19.02 percent increase) in FY 2015 to accelerate the development of lighting, heating and cooling, and other energy efficiency solutions for buildings and supporting the equipment and appliance standards programs, to establish minimum energy efficiency requirements pursuant to federal regulations. The FY 2015 funding request plans to assist home builders achieve higher efficiency levels, improve access for homeowners to home improvement services, and improve the information, tools, and resources available to the commercial sector with a goal of achieving 20 percent energy savings by 2020.

The Advanced Research Projects Agency –Energy (ARPA-E)

ARPA-E was established in 2007 by the America COMPETES Act (P.L.110-69), and is charged with developing energy technologies that result in “(i) reductions of imports of energy from foreign sources; (ii) reductions of energy-related emissions, including greenhouse gases; and (iii) improvement in the energy efficiency of all economic sectors.” The mission of ARPA-E is to support innovations in energy technology that enhance economic and energy security, reduce energy imports, improve energy efficiency, and ensure the U.S. leads in technological

⁷ For more information on the EV Everywhere Grand Challenge: http://www1.eere.energy.gov/vehiclesandfuels/electric_vehicles/index.html

⁸ For more information on FORGE: http://www1.eere.energy.gov/geothermal/news_detail.html?news_id=21286

innovation. The program focuses exclusively on high-impact innovations that aim to translate science into breakthrough technologies. In FY 2015, ARPA-E requests \$325 million, an increase of \$40 million or 16 percent above FY 2014 appropriations.

Fossil Energy R&D (FE)

The DOE Office of Fossil Energy (FE) supports R&D focused on coal (including clean coal technologies), gas, and petroleum, and supports the Federal Government's Strategic Petroleum Reserve. FE R&D activities request \$475.5 million for FY 2015, a decrease of \$86.4 million or -15.4 percent from FY 2014 appropriations.

Fossil Energy Research and Development (FE R&D) advances technologies related to the reliable, efficient, affordable, and environmentally sound use of fossil fuels. FE leads Federal research, development, and demonstration efforts on advanced carbon capture, and storage (CCS) technologies to facilitate achievement of the President's climate goals. FE also develops technological solutions for development of our unconventional domestic resources.⁹

The Natural Gas Technologies focuses on technologies to reduce the carbon footprint, emissions, and water use of unconventional domestic natural gas resources. The Department of Energy, Department of the Interior, and Environmental Protection Agency are engaged in an inter-agency taskforce to address challenges associated with developing unconventional resources. FE R&D includes advancements in technology, methodology, risk assessment, and mitigation.

Nuclear Energy (NE)

The primary mission of the Office of Nuclear Energy (NE) is to support the diverse civilian nuclear energy programs of the U.S. Government, and Federal efforts to research and develop nuclear energy technologies, including generation, safety, waste storage and management, and security technologies, to help meet energy security, proliferation resistance, and climate goals. NE requests a total of \$863.4 million for FY 2015, a decrease of \$25.0 million or 2.8 percent below FY 2014 appropriations.

Nuclear energy R&D activities are primarily divided into four programs: SMR Licensing Technical Support, Supercritical Transformational Electric Power Generation, Reactor Concepts Research, Development and Demonstration, Fuel Cycle Research and Development, and Nuclear Energy Enabling Technologies, which funds crosscutting nuclear research initiatives. NE also provides significant funding for Radiological Facilities Management, International Nuclear Energy Cooperation and Idaho Facilities Management and Idaho Sitewide Safeguards and Security.

Electricity Delivery and Energy Reliability (OE)

The mission of the Office of Electricity Delivery and Energy Reliability is electric grid modernization and resiliency in energy infrastructure through research, demonstration,

⁹ DOE Budget Highlights, p. 28.

partnerships, facilitation, modeling and analytics, and emergency preparedness and response. OE is the Federal government's energy sector-specific lead in responding to energy security emergencies, both physical and cyber. OE also plays a critical role in implementation of the President's Climate Action Plan to mitigate the risks and enhance resilience against climate change. The FY 2015 Request emphasizes increased electric grid resilience, manage risks, increase system flexibility and robustness, increase visualization and situational awareness, and deployment of advanced control capabilities. OE also conducts R&D activities in addressing the strains of intermittent generation from wind and solar power sources on the electric system.

Total funding requested for these activities is \$180.0 million, an increase of \$32.8 million or 22.3 percent over FY 2014 appropriations.

Loan Guarantee Program Office (LPO)

Title 17 of the Energy Policy Act of 2005 authorizes DOE to make loan guarantees to encourage early commercial energy projects which avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases; employ new or significantly improved technologies; and offer a reasonable prospect of repayment of the principal and interest on the guaranteed obligation.

The mission of the LPO is to "accelerate the domestic commercial deployment of innovative and advanced clean energy technologies at a scale meaningful to contribute meaningfully to our national clean energy objectives."¹⁰ The LPO executes this mission by guaranteeing loans to eligible clean energy projects and providing direct loans to eligible manufacturers of advanced technology vehicles and components.

The FY 2015 budget request is \$7 million for administrative expenses, which will enable LPO to continue active monitoring of closed projects, a decrease of \$13 million or 65% of FY 2014 level.

¹⁰ Loan Program Office. Accessible at: <http://lpo.energy.gov/about/our-mission/>

Chairman SMITH. The Committee on Science, Space, and Technology will come to order. Welcome to today's hearing titled, "Department of Energy Science and Technology Priorities." And let me say to Members at the outset, and we don't have everyone here whom we expect to be here in just a few minutes because the Democrats have a caucus at 9:00, and we have several Members at that caucus and we hope that they will be here in a few minutes.

But we are going to be a little bit cramped in time today. We have two votes. The first series of votes is at 10:00, in less than an hour. We will come back after that series for about 45 minutes. And then we have another series of votes starting at 11:00 that will take us through 12:15, and the Secretary needs to leave at 12:30. So we may have a very short hearing today from now until 10:00 and then from about 10:15 or 10:30 until 11:00 or 11:15. So we will try to expedite the process here, but yet hopefully everybody who has a question or two will be able to ask those questions.

I would like to welcome two Members to the Science, Space, and Technology Committee who are new Members. First is Representative Bill Johnson from Ohio's 6th Congressional District to my left, and Representative Katherine Clark from Massachusetts' 5th Congressional District, and she will be here momentarily. An engineer by training, Representative Johnson served 26 years in the United States Air Force, started his own high-tech business and ran a multi-million dollar department for a major electronics manufacturer. It doesn't hurt that he holds a Master's degree in computer science from Georgia Tech. He also joins Representative Thomas Massie on the Committee as a patent holder. Representative Johnson will serve on the Research and Technology Subcommittee and the Oversight Subcommittee as well, and we welcome Bill to the Committee.

Mr. JOHNSON OF OHIO. Thank you, Mr. Chairman. I am honored to serve.

Chairman SMITH. I wish she were here, but I will introduce her in her absence and that is that we welcome also Representative Katherine Clark from Massachusetts, joining us on the other side of the aisle here. She has a special interest in alternative forms of energy and no doubt will enjoy today's hearing, her first. I might also add there aren't many attorneys on the Committee. Katherine Clark is, and no doubt her Cornell law degree will enable her to cross examine witnesses, though I doubt she is too tough on today's witness.

You know, come to think of it, that gives us two lawyers from Massachusetts including Joe Kennedy, which is definitely our limit.

The Ranking Member, Ms. Johnson, is recognized for her comments about Representative Clark.

Ms. JOHNSON OF TEXAS. Thank you very much, Mr. Chairman. I would like to welcome Mr. Johnson as well. Ms. Clark was appointed to the Committee last week, and we have visited. She was a State Senator in Massachusetts before winning election to the House, and she is very interested in energy and education issues, and I look forward to working with her.

And as I indicated earlier, every Thursday morning at 9:00, we have a mandatory attendance meeting, and she probably stopped there. Thank you.

Chairman SMITH. Okay. Thank you, Ms. Johnson. I will recognize myself for an opening statement and then the Ranking Member.

The Science, Space, and Technology Committee has jurisdiction over civilian science and technology issues at the Department of Energy. These areas comprise approximately one third of DOE's budget or over 9 billion dollars. Our jurisdiction includes the DOE's Office of Science which conducts critical research in areas like high energy physics, advanced scientific computing, and basic energy sciences. Our jurisdiction also includes research and development in fossil, nuclear and renewable energy.

I want to thank our witness, Secretary Moniz, for joining us today. We last heard from Dr. Moniz in June, and we want to thank him for continuing our tradition of hearing from the DOE Secretary on budget priorities.

Dr. Moniz has a deep knowledge of energy issues, particularly the scientific and technical issues that are a focus of this Committee. Although we may disagree on some priorities and on overall budget numbers, one thing we can agree on is how critical DOE research has been to securing the United States' preeminence in many scientific fields.

Scientists at the Department of Energy and in the private sector have consistently collaborated to create the most reliable, affordable and secure domestic energy portfolio in the world.

The technological advancements in oil and gas extraction, and particularly hydraulic fracturing, were facilitated in part by DOE. These innovative technologies enabled the dramatic shale gas revolution that is transforming our economy. Technological breakthroughs and improved techniques have resulted in exponential increases in energy production. In my home State of Texas, production of oil has jumped from 400 million barrels in 2009 to over 900 million barrels in 2013.

The technological leaps in natural gas extraction have resulted in increased production and a decrease in natural gas prices. These innovative breakthroughs have also helped improve air quality, expand access to affordable electricity and created jobs. This increased production in oil and gas is exciting, but we also need to seek a balanced energy portfolio through a strategic approach to energy research and development.

Although the Obama Administration claims it supports a balanced energy portfolio, its budget request shows a different set of priorities. For instance, while research and development for fossil energy programs remains stagnant, funding for renewable energy has increased exponentially.

Lastly, we need to ensure that American tax dollars are spent wisely, and not on duplicative and overlapping programs. At a time of tightened budgets, we have to set priorities. Our first focus should be basic energy research and development. Breakthrough discoveries from basic research will provide the foundation for a secure, affordable and independent energy future.

The Administration should not pick winners and give subsidies to favored companies that promote non-competitive technologies. This too often leads to a waste of taxpayer dollars.

Instead, we should focus our resources on research and development that will produce technologies that will enable alternative energy sources to become economically competitive without the need for subsidies.

This is an exciting time for the United States. It is a time of abundant energy resources. The government has a role in promoting scientific discovery in various energy fields, and basic energy research is the stepping stone to our continued success.

[The prepared statement of Mr. Smith follows:]

PREPARED STATEMENT OF CHAIRMAN LAMAR S. SMITH

The Science, Space, and Technology Committee has jurisdiction over civilian science and technology issues at the Department of Energy (DOE). These areas comprise approximately one third of the DOE's budget, or over nine billion dollars.

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Although the Obama Administration claims it supports a balanced energy portfolio, its budget request shows a different set of priorities. For instance, while research and development for Fossil Energy programs remains stagnant, funding for Renewable Energy has increased exponentially.

Lastly, we need to ensure that American tax dollars are spent wisely, and not on duplicative and overlapping programs. At a time of tightened budgets, we have to set priorities. Our first focus should be basic energy research and development. Breakthrough discoveries from basic research will provide the foundation for a secure, affordable and independent energy future.

The Administration should not "pick winners" and give subsidies to favored companies that promote non-competitive technologies. This too often leads to a waste of taxpayer dollars. Instead, we should focus our resources on research and development that will produce technologies that will enable alternative energy sources to become economically competitive without the need for subsidies.

This is an exciting time for the United States. It is a time of abundant energy resources. The government has a role in promoting scientific discovery in the various energy fields. Basic energy research is the stepping stone to our continued success.

Chairman SMITH. That concludes my opening statement, and the gentlewoman from Texas is recognized for hers.

Ms. JOHNSON OF TEXAS. Thank you very much, Mr. Chairman, for holding the hearing today, and I want to thank the Secretary for being here to discuss the proposed DOE budget and for his continued service to our Nation. Over the past year I think that it has been proven that the President made a wise choice in selecting the Secretary to lead the Department at this critical time our Nation's history.

Let me start by reminding or sharing with my colleagues here today that we have seen how government research can pay off when it comes to energy development. DOE-supported research was key to the development of high-efficiency gas turbines for coal plants, nuclear reactors developed at Federal labs and the directional drilling and the hydraulic fracturing practices that have led to the shale gas boom of today. But we should remember that those achievements required decades of Federal investments, the overwhelming majority of which was focused on fossil and nuclear energy. I continue to strongly support research to make today's technologies safer, cleaner and more efficient. But we also have to find the greatest value for our investment of taxpayers' dollars. Today it is the emerging energy technology sectors that I believe can most benefit from government support. That is where the priorities is set by the Fiscal Year 2015 budget requests come in today.

I am pleased with much of the Department's budget request for applied energy research this year. If adopted, the Office of Energy Efficiency and Renewable Energy, ARPA-E, and the Office of Electricity would all receive a much-needed boost to advance the development of clean energy technologies that will be vital to our national security, our economy and the environment in the decades to come. This includes important targeted investments that will help place the United States in a position to be a world leader in advanced manufacturing related to energy use and generation.

However, I do have concerns with other areas of the Department's proposed budget. For example, the Office of Science would receive a very minimal increase, less than one percent, which is even below the rate of research-related inflation. So this is effectively a cut. As we all know, the Office of Science is the largest supporter of basic research in the physical sciences in the country, and it operates more than 30 national scientific user facilities whose applications go well beyond energy innovation. Our Nation's top researchers from industry, academia and other Federal agencies use these facilities to examine everything from new materials that will better meet our military's needs to new pharmaceuticals that will better treat disease to even examining the fundamental building blocks of the universe. Given this critical role in our Nation's innovation enterprise, I look forward to having a productive discussion about the justification for the Administration's proposed funding for the Office.

Also, I recognize the Department is continuing to carry out several major demonstration projects using prior year funds to further advance our ability to capture and store carbon emissions from power plants. I also know that you recently issued a significant loan guarantee solicitation for new fossil fuels projects, but I would like to be clearer and like a clear explanation for the Department's proposed cuts to the carbon capture and storage research programs.

Of course, demonstration projects and loan guarantees have a very important role in getting new technologies to the marketplace, but they are not necessarily replacements for the longer term, higher risk research activities. I fully understand that the Administration is working on a tough budget environment and that trade-offs and compromises have to be made. I look forward to working with you, Mr. Secretary, and my colleagues across the aisle to address the concerns we have and to work with you to ensure you have the direction, tools and resources you need to keep secure our Nation's energy future.

Mr. Chairman, before I yield back, I want—well, she hadn't come in yet. I wanted to introduce our new Member, but she has not yet arrived. So thank you.

[The prepared statement of Ms. Johnson follows:]

PREPARED STATEMENT OF RANKING MEMBER EDDIE BERNICE JOHNSON

Thank you, Chairman Smith for holding this hearing. I would also like to thank Secretary Moniz for being here today to discuss the proposed DOE budget and for his continued service to our nation. Over the past year, you have proved that the President made a wise choice in selecting you to lead the Department at this critical time in our nation's history.

Let me start by reminding my colleagues here today that we have seen how government research can pay off when it comes to energy development. DOE-supported research was key to the development of high-efficiency gas turbines for coal plants, nuclear reactors developed at federal labs, and the directional drilling and hydraulic fracturing practices that have led to the shale gas boom of today. But we should remember that those achievements required decades of federal investment, the overwhelming majority of which was focused on fossil and nuclear energy. I continue to strongly support research to make today's technologies safer, cleaner, and more efficient, but we also have to find the greatest value for our investment of taxpayer dollars. Today it is the emerging energy technology sectors that can most benefit from government support. That is where the priorities set by the Fiscal Year 2015 budget request come into play.

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With that I yield back the balance of my time.

Chairman SMITH. Thank you, Ms. Johnson. Let me introduce our witness, and he is Honorable Ernest Moniz, Secretary of the Department of Energy. Prior to his appointment, Dr. Moniz was the head of the Department of Physics at the Massachusetts Institute of Technology where he was a faculty member since 1973. Previously, Dr. Moniz served as Undersecretary of the Department of Energy where he oversaw the Department's Science and Energy programs. From 1995 to 1997, he served as Associate Director for Science in the Office of Science and Technology Policy in the Executive Office of the President. Dr. Moniz received a Bachelor of Science degree in physics from Boston College and a doctorate in theoretical physics from Stanford University.

So Dr. Moniz brings both impressive academic credentials and practical skills to a very demanding job. Dr. Moniz, we welcome you and look forward to your testimony.

**TESTIMONY OF THE HONORABLE ERNEST MONIZ,
SECRETARY, DEPARTMENT OF ENERGY**

Secretary MONIZ. Well, thank you, Chairman Smith, and Ranking Member Johnson, Members of the Committee. In view of the schedule, I will try to shorten my opening statement.

The top line discretionary budget request for Fiscal Year 2015 as you know is \$27.9 billion department-wide which is a 2.6 percent increase, which in the current, very constrained budget environment, we take as an endorsement of the importance of our very key missions in energy in science, in nuclear security, in maintaining the scientific base that you have both said is so critical to this country and of course, meeting our obligations to clean up the Cold War mess.

Our budget is organized around our three undersecretary positions which we testified about last year. We have reorganized including, importantly I think for this Committee, combining the Undersecretaries of Energy and Science into one office, and I will come back to some of the benefits I believe we are seeing from that, a second in nuclear security, and finally, a new focus on management and performance which we consider to be essential. That is, improved management and performance essential to successfully carrying out our energy, science and nuclear security missions.

On science and energy, which of course is the main focus today, I'd just reiterate that the all-of-the-above energy approach we believe is succeeding as the President said in his State of the Union, as you well know, producing more gas, more oil and yet driving down carbon emissions. Again, I will forego many of my specific comments. Note that the budget request in energy and science is \$9.8 billion, which is a five percent increase within which we of course had to set priorities.

A few highlights in EERE, I will note a strong commitment to advanced manufacturing, Office of Electricity, a commitment to

leading a multi-program effort on grid modernization and at the same time increasing our emergency response capability, which we have as a responsibility under FEMA in responses.

ARPA-E, we think it is working. We propose an increase. Twenty-four start-ups have emerged from ARPA-E, significant private capital following up, and I would note its entrepreneurial spirit. With each project we have assigned a tech-to-market advisor.

The Office of Science, again, many initiatives. I will mention exascale computing as one that we feel is very important and emphasize once again, this is a cross-cut with about 2/3 of the funding proposed in the Office of Science and about 1/3 in NNSA as a collaboration, which I might note is a reversal of the 1990s with science now having the lead here.

This theme of cross-cuts is one that draws upon our reorganization with science and energy coming together. I have mentioned a couple already. Others include subsurface science and engineering, which cuts across hydrocarbon production, CO₂ sequestration, geothermal systems, many issues. Our labs are very excited about this kind of integrated approach in the cross-cuts. And another one that will be emerging, we have just put our toe in the water this year and next year we hope to come back with a much stronger energy and water cross-cut which we think is going to be one of the key issues in the energy sector as we go forward.

So nuclear security, again, I will just say there we have an \$11.9 billion proposal, a four percent increase, looking both at reestablishing a fiscally doable approach to our nuclear stockpile, a safe and reliable stockpile without testing and advancing our nuclear nonproliferation programs, management and performance, and I should say Naval reactors, also a commitment there to some key developments that have been postponed for a while, Ohio-class replacements for example, spent fuel recapitalization projects.

Management performance, \$6.5 billion in that line, most of the budget for EM, and there I will just emphasize this provides an enterprise-wide focus for trying to improve our project management performance, and we believe it is paying dividends. One example, the waste treatment facility at Hanford, arguably the most complicated facility for clean-up, a new framework that has been agreed to with the state as to how we approach—a phased approach, much to work out yet in terms of milestones, et cetera. Secondly, another example in the nuclear security space, the uranium processing facility with a new Red Team approach, stick to our budget, phase it, key capabilities respected, but stay with budget discipline.

So that, sir, Mr. Chairman, is kind of a few of the highlights, and I look forward to our discussion.

[The prepared statement of Secretary Ernest Moniz follows:]

**Testimony of Secretary Ernest Moniz
U.S. Department of Energy
Before the
House Committee on Science, Space, and Technology
April 10, 2014**

Chairman Smith, Ranking Member Johnson, and Members of the Committee, thank you for the opportunity to appear before you today to discuss the Department of Energy's (DOE) Budget Request for fiscal year (FY) 2015. I appreciate the opportunity to discuss how the budget request advances our clean energy, science, nuclear security, and nuclear waste cleanup goals to carry out the President's priorities.

The President has made clear that the Department of Energy has significant responsibilities for advancing the nation's prosperity and security through its mission. In particular, I would like to highlight three critical mission areas of the Department.

As the President said in the State of the Union address, "the all-of-the-above energy strategy I announced a few years ago is working, and today, America is closer to energy independence than we've been in decades." This strategy is driving economic growth and creating jobs, while lowering our carbon emissions. We are producing more natural gas in the United States than ever before. And for the first time in twenty years, we are producing more oil at home than we import from the rest of the world. We have also made remarkable progress in clean and renewable energy. In the last five years, we have more than doubled the amount of electricity we generate from wind and solar. At the same time, we are making the investments that will enable coal and nuclear power to be competitive in a clean energy economy, and aggressively advancing efficiency for its economic and environmental benefits.

In June 2013, the President launched the Climate Action Plan. Under this plan, the Department is working to reduce the serious threat of climate change and, with a heightened focus on resilience, preparing American communities for the impacts of a changing climate that are already being felt.

Just over a week ago at the Nuclear Security Summit in The Hague, the President reiterated his commitment to nuclear nonproliferation and security, calling on the global community to decrease the number of nuclear weapons, control and eliminate nuclear weapon-usable materials, and build a sustainable and secure nuclear energy industry. All of these areas are central to the Department of Energy's mission: maintaining a strong and credible strategic deterrent, working to secure and eliminate vulnerable nuclear materials around the world, and advancing safe nuclear power technology for the decades ahead.

Both of these mission areas – clean energy and nuclear security – depend on sustaining America's research and development (R&D) leadership. The Department of Energy, to a large extent through our seventeen national laboratories, plays a key role in our nation's respective advantage in the physical sciences.

Finally, the President's Management Agenda includes an emphasis on Federal agencies' effective and efficient execution of their missions for the American people.

Carrying Out DOE's Top Priorities through an Effective Organization

The Department of Energy's budget request for fiscal year (FY) 2015 aligns the agency's funding and organization with these three presidential priorities.

First, while the Department's science and energy programs have previously been managed and overseen separately by two under secretariats, we have merged those roles into a single Under Secretary for Science and Energy to more effectively carry forth our science and energy priorities. I'll discuss some of the cross-cutting initiatives facilitated by this new organizational structure, as well as how we are reexamining and strengthening the way we work with our National Laboratories to better carry out our science and energy missions.

Next, an Under Secretary for Nuclear Security, who also serves as Administrator for the National Nuclear Security Administration, oversees our nuclear security

missions and ensures effective and efficient collaboration across under secretariats on crosscutting activities and missions. This Under Secretary is also engaging in discussions with the National Laboratories and with Congress to ensure that all of our sites are working to serve the public interest to the greatest extent possible. This position is, of course, established with the principle high level charge of preserving U.S. nuclear security, this why we are moving the Office of Environmental Management to the new Undersecretary for Management and Performance.

Finally, we created the Under Secretary for Management and Performance to implement a strong focus on management to effectively carry out our missions on behalf of the American people. It is not a secret that DOE has room for improvement in this area, and establishing this new position will bring focus and leadership to these challenges.

This Under Secretary focuses on management across the Department, and oversees our environmental cleanup programs. It is inherently complex and challenging to design and implement one-of-a-kind projects to nuclear safety standards. We have had many successes in implementing major projects at the Department of Energy, and obviously we have had and are continuing to have major challenges. We have reduced our Cold War legacy “footprint” by 74 percent. But of course, the most complex and difficult projects remain. A focus on management and performance is critical to further building upon our successes and overcoming our challenges.

The Department of Energy’s top-line discretionary budget request for FY 2015 is \$27.9 billion, a 2.6 percent increase above FY 2014. The Department of Energy’s 2.6 percent increase recognizes our high-priority missions for clean energy and addressing climate change, nuclear security, and innovation. The Department of Energy’s budget request includes \$9.8 billion for energy, science, and related programs, \$11.9 billion for nuclear security, and \$6.5 billion for management and performance and related programs. I will discuss the budget request for each of these three programmatic areas in more detail.

Recognizing the importance of the two-year budget agreement Congress reached in December, the Budget adheres to the 2013 Bipartisan Budget Act’s discretionary

funding levels for 2015. However, these levels are not sufficient to expand opportunity to all Americans or to drive the growth our economy needs, and the need for pro-growth investments in infrastructure, education, and innovation has only increased due to the Great Recession and its aftermath. For that reason, the Budget also includes a separate, fully paid for \$56 billion Opportunity, Growth, and Security Initiative (OGSI), which shows how additional discretionary investments in 2015 can spur economic progress, promote opportunity, and strengthen national security. Consequently, in addition to the base budget submission of \$27.9 billion for the Department of Energy, OGSI provides \$1.6 billion for additional investments at the Department of Energy. Those investments consist of over a billion dollars in the energy and climate arena—including \$355 million for climate resilience and \$684 million for clean energy and energy efficiency activities—and \$600 million for additional investments in nuclear security.

In addition to our discretionary budget and OGSI, the Budget also proposes an Energy Security Trust. This \$2 billion investment over 10 years will support R&D into a range of cost-effective technologies – like advanced vehicles that run on electricity, homegrown biofuels, renewable hydrogen, and domestically produced natural gas – and will be drawn from existing royalty revenues generated from Federal oil and gas development.

Science and Energy

The budget request includes \$9.8 billion for science and energy programs to further our all-of-the-above energy strategy, support the President’s Climate Action Plan, continue the Quadrennial Energy Review, and maintain global scientific leadership. The request includes \$4.7 billion for a portfolio of energy activities consisting of our applied energy programs, the Advanced Research Projects Agency—Energy (ARPA-E), the Loan Programs, International Affairs, the Energy Information Administration, our new Energy Policy and Systems Analysis program, our proposed consolidation of the Office of Indian Energy Policy and Programs, and the Power Marketing Administrations. These offices reflect the wide diversity of programs, roles, and responsibilities that we have in the Nation’s energy sector.

The budget request for science and energy also includes \$5.1 billion for the Office of Science, which provides the national research community with unique research opportunities at major facilities for nuclear and particle physics, energy science, materials research and discovery, large-scale computation, and other disciplines.

Together, these programs support the President's Climate Action Plan, further an all-of-the-above energy strategy, and promote and sustain U.S. leadership in science and technology innovation to ensure that clean energy technologies are invented and manufactured here in America.

Energy Efficiency and Renewable Energy

The Department's Office of Energy Efficiency and Renewable Energy (EERE) is the U.S. Government's primary clean energy technology organization, working with many of America's best innovators and businesses to support high-impact applied research, development, demonstration, and deployment (RDD&D) activities in the areas of sustainable transportation, renewable power, and energy efficiency.

EERE has experienced tremendous success in contributing to efforts to reduce U.S. dependence on foreign oil, save American families and businesses money, and grow the domestic clean energy industry. For example, EERE has helped manufacturers increase their energy productivity, including providing technical support to 590 combined heat and power projects between FY 2009 and FY 2013. Since 1979, EERE-supported RD&D has advanced 220 new manufacturing technologies that can and will continue to significantly increase energy efficiency. In addition, through the EERE-supported SuperTruck Initiative, EERE partners have developed a full-scale, prototype class 8 heavy-duty truck that is 61% more efficient than current technology. And these are only a couple of examples of the work underway.

The budget request for EERE is \$2.3 billion, a 22 percent increase over the FY 2014 enacted level to fully support investments in these areas of sustainable transportation, renewables, and efficiency and manufacturing.

From day one as Secretary, I have placed a strong emphasis on energy efficiency. This budget follows through on that focus by proposing a 39 percent increase in energy efficiency programs in building efficiency, weatherization of homes, advanced manufacturing, and Federal energy and State and local partnership activities. This increase includes funding for activities, such as developing and issuing new appliance standards and working with States on building code development, to strongly promote energy efficiency in support of our goals for the climate, the economy, and American competitiveness.

In his State of the Union address, the President articulated his vision for supporting American manufacturing, including a focus on increasing the number of our manufacturing institutes to accelerate U.S. development of world-leading manufacturing technologies and capabilities. These Institutes connect businesses to research universities that can help America lead the world in advanced technologies. In addition to DOE's contribution to the first institute on additive manufacturing led by the Department of Defense, the Department of Energy awarded an additional institute this year that specializes in wide bandgap semiconductors and announced a competitive solicitation for an additional institute on advanced composites. The FY 2015 budget request will support at least one additional manufacturing institute funded at up to \$70 million over five years, with at least one-to-one matching funds from the recipient.

Vehicle technologies are a major focus of DOE's EERE budget request and of the Energy Security Trust proposal. The FY 2015 budget request supports research, development, demonstration, and deployment of efficient and alternative fuel vehicles, including the EV Everywhere goal that aims to make electric vehicles as affordable and convenient as the gasoline powered vehicles we drive today by 2022. This would be accomplished through cost reduction and improved performance in batteries, electric drive systems, lightweight materials, and integration with the electric power grid. The request also includes funding to continue a focused research and development effort to reduce the cost and increase the durability of fuel cell systems. The request further includes \$60 million, administered through authority provided by the Defense Production Act, in collaboration with the Departments of Agriculture and Defense, to continue to

enable the objective of producing advanced biofuels that meet military specifications at a price competitive with petroleum—an initiative first supported with DOE funding in FY 2014.

The Department's budget request also continues to advance renewable energy through a number of ongoing initiatives. The request supports the SunShot Initiative's mission to make solar energy technologies, including both solar photovoltaic (PV) and CSP technologies, cost-competitive with traditional sources of electricity, without subsidies, by 2020. It supports research, development and demonstration for wind energy, including funds for three advanced offshore wind demonstration projects to be operational by 2017, and it includes funding to advance technologies in both conventional hydropower and marine and hydrokinetic devices. The request continues to support the Frontier Observatory for Research in Geothermal Energy (FORGE), a new geothermal energy R&D project started in FY 2014, and a critical step for learning how to harness our vast but untapped domestic geothermal resources through enhanced geothermal systems.

Fossil Energy

As part of our all-of-the-above energy strategy, DOE's Fossil Energy Research and Development program advances technologies related to the reliable, efficient, affordable, and environmentally sound use of fossil fuels which are essential to our Nation's security and economic prosperity. Since President Obama took office, the Department of Energy has invested more than \$6 billion in carbon-capture and storage (CCS) research, development and demonstration. The Office of Fossil Energy is leading this charge, supporting critical research and deployment efforts to ensure that all sources of energy, including fossil fuels, are competitive in a carbon constrained economy.

The budget request continues the Department's strong focus on carbon-capture and storage (CCS) through its \$476 million request for Fossil Energy (FE) Research and Development. In addition to our current portfolio of demonstration projects, The request includes \$25 million for a new demonstration program, Natural Gas Carbon Capture and Storage (NG-CCS), to support a project to capture and store carbon emissions from natural gas power systems. Looking into the future, CCS

technologies will be required for natural gas, as with coal, to be a major player in a low-carbon world.

In addition, the Loan Guarantee Program is currently receiving applications for up to \$8 billion in loan guarantees focused on advanced fossil energy projects that reduce CO₂ emissions. Together with these ongoing projects and the fossil loans, the FY 2015 budget request constitutes a major fossil energy program.

The request includes \$15.3 million to implement priority collaborative research and development with the Environmental Protection Agency and Department of the Interior to ensure that shale gas development is conducted in a manner that is environmentally sound and protective of human health and safety; \$4.7 million to fund a new midstream natural gas infrastructure program focused on advanced cost-effective technologies to detect and mitigate methane emissions from natural gas transmission, distribution, and storage facilities and to communicate results on methane emissions mitigation to stakeholders; and, \$15 million to conduct lab- and field-based research focused on increasing public understanding of methane dynamics in gas-hydrates bearing areas.

The budget request provides for the full operational readiness of the Strategic Petroleum Reserve including restoration of its designed drawdown capability.

Nuclear Energy

The Office of Nuclear Energy works to advance nuclear power as a resource capable of contributing to meeting the Nation's energy supply, environmental, and national security needs. The budget request for the Office of Nuclear Energy, \$863.4 million, is roughly flat compared to the FY 2014 appropriated level. The Office will continue ongoing work with particular focus in two main areas: the development of next-generation nuclear reactors and the management of nuclear waste.

For next-generation reactors, the budget request continues to fund research and development on advanced reactor technologies, as well as technical support for two awards to help accelerate the commercialization of small modular reactors. It

also provides funding for the continuation of the Department's first Energy Innovation Hub into a final five year term, assuming the determination is made that the Hub meets all requirements and criteria to be eligible for renewal. The Department is using a formal process make the renewal determination, which will be completed within FY 2014. This hub is focused on nuclear energy modeling and simulation and currently centered at Oak Ridge National Laboratory.

In addition to the focus on new reactor technologies, the budget request funds for activities to advance the Administration's *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste*. The budget request continues to lay the groundwork for implementation within existing authorities by providing \$79 million for Used Fuel Disposition activities, including \$30 million for generic process development and other activities related to storage, transportation, disposal, and consent-based siting, and \$49 million for related generic research and development. The budget also includes a funding reform proposal needed to support implementation of the nuclear waste management program over the long term.

Electricity Delivery and Energy Reliability

The Electricity Delivery and Energy Reliability (OE) program drives electric grid modernization and resiliency in the energy infrastructure through research and development, partnerships, facilitation, modeling and analytics, and emergency preparedness and response. OE also serves as the Federal government's primary liaison to the energy sector in responding to energy security emergencies, both physical and cyber.

OE's development of advanced sensors to measure the flow of electricity in real time is enabling grid operators to monitor system health and mitigate disturbances. Roughly 1700 sensors have now been installed nation-wide, providing wide visibility of the grid that can prevent the kind of cascading events that caused the 2003 blackout. OE's cybersecurity research has produced commercially available tools designed specifically for the energy sector. Just one example is a tool to assist the electricity sector assess and strengthen their cybersecurity maturity posture. This program has been accessed by over 100 utilities and has now been adapted

and released for use by the oil and natural gas sector. OE also responded to three energy emergency events in FY 2013, including Superstorm Sandy, facilitating restoration efforts through trained analysts and responders coupled with the deployment of the program's near-real time visualization capability, enabling quicker power restoration and fuel delivery systems.

The budget request, \$180 million, includes a substantial increase for OE, over 20 percent, to emphasize grid modernization and resiliency in several areas. The budget increase supports the Department's growing focus on increasing the resiliency of the energy infrastructure through emergency preparedness and response. From the severe cold weather over the past winter to extreme storms, including Superstorm Sandy, we have seen how important these activities are. The Department is also focused on the growing danger of cyber-attacks and the physical security of the grid. The budget increases funding to strengthen the energy infrastructure, critical for national, economic and energy security, against both natural and man-made hazards, through research and development and through the establishment of an Energy Resilience and Operations Center.

The budget increase also helps move the Nation closer not only to a more resilient grid, but one that is also more reliable, efficient and flexible through research and development into microgrids and grid-scale energy storage. It also invests in transformation of the distribution system toward higher performance through new, more advanced control systems.

Advanced Research Projects Agency—Energy

The Advanced Research Projects Agency—Energy (ARPA-E) program takes a unique entrepreneurial approach, supporting high-risk high-reward energy technology research projects that could create the foundation for entirely new industries, but are too early in their development for private sector investment. With ARPA-E, we are swinging from the heels and trying to hit home runs, not just base hits.

ARPA-E has invested over \$900 million across 363 projects through 18 focused programs and two open funding solicitations. In the past year alone, ARPA-E has

launched focused programs to improve techniques to manufacture light-weight metals, develop robust battery chemistries and architectures for electric vehicles, biologically convert natural gas to liquids, create innovative semiconductor materials for improved power conversion, and use solar concentration techniques for hybrid solar converters. To date, 22 ARPA-E projects have attracted more than \$625 million in private-sector follow-on funding after ARPA-E's investment of approximately \$95 million.

ARPA-E funded companies and research teams have successfully engineered microbes that use carbon dioxide and hydrogen to make a fuel precursor for cars, developed a one megawatt silicon carbide transistor the size of a fingernail, produced a new hardware device that regulates the flow of power on the electrical grid and software that allocates electricity in much the same way internet routers allocate bandwidth throughout the internet.

The budget request provides \$325 million for ARPA-E, a 16 percent increase, which will be split between an open solicitation to capture potentially transformational ideas not within the scope of existing programs, as well as 4-5 new programs looking at critical energy challenges.

Loan Programs

The Department's Loan Programs Office supports a large, diverse portfolio of more than \$30 billion in loans, loan guarantees, and commitments, supporting more than 30 closed and committed projects. The projects that LPO has supported include one of the world's largest wind farms; several of the world's largest solar generation and thermal energy storage systems; the first new nuclear reactors to begin construction in the U.S. in more than three decades; and more than a dozen new or retooled auto manufacturing plants across the country. The program as a whole is performing very well to date, with losses below expected levels.

The example of utility scale solar shows how the Loan Program can jumpstart an entire industry. If we think back to 2009, photovoltaic projects larger than 100 MW were non-existent in the United States. And there was no commercial financing market for large solar projects. Using Recovery Act Funds, our Loan Program

Office financed the first six utility scale PV projects in the United States. And these projects helped prove to private industry that the technology was viable and cost effective. Since our initial investments, ten new utility scale projects have been funded by the private sector.

The budget request includes administrative funds for the Title 17 Innovative Technology Loan Guarantee Program and the Advanced Technology Vehicles Manufacturing Loan Program. While the budget does not propose new loan authority or credit subsidies, I would note that the Loan Program celebrated a number of milestones in the last few months, including the opening of the Ivanpah solar plant—the world’s largest solar-thermal plant—and the financial closing of two loan guarantees to support the construction of the Vogtle nuclear reactor project. We have also begun accepting applications for an \$8 billion advanced fossil energy loan guarantee solicitation, and we look forward to continue to use the Program’s existing authority to support the President’s all-of-the-above energy strategy.

Energy Information Administration

The Energy Information Administration (EIA) is the statistical and analytical agency in the Department of Energy. EIA collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding of energy and its interaction with the economy and the environment. In the last year, EIA released a new Drilling Productivity tool, which has already received widespread, praised from industry participants and will also lead to a more accurate baseline for production estimates in many other of EIA’s reports. In 2013, EIA also launched the most comprehensive portal of the U.S. government’s national and state energy data currently available.

EIA is important both to the mission of the Department and also to the functioning of energy markets. The budget request proposes \$122.5 million, an increase of 5 percent, to fully support EIA’s important capabilities through upgrades to its infrastructure and the development of the new products for evolving energy markets.

Energy Policy and Systems Analysis

The Office of Energy Policy and Systems Analysis (EPSA), established last year, serves as my principal policy advisor on energy and related integration of energy systems and acts as a focal point for the Department's analysis and development of energy policy that could facilitate the transition to a clean and secure energy economy. EPSA carries out strategic studies and policy analysis, maintains and coordinates a supporting set of analytical capabilities, and carries out assessments of the strength, resiliency, and anticipated challenges of national energy systems.

By identifying and prioritizing ways in which DOE programs may be strengthened to contribute to the economic well-being, environmental quality, and energy security of the United States, EPSA plays a critical role in the Department's policy formulation, and in efforts like the Quadrennial Energy Review (QER) and DOE's crosscutting grid modernization initiative.

The QER report will provide an integrated view of, and recommendations for, Federal energy policy in the context of economic, environmental, occupational, security, and health and safety priorities, with attention in the first report given to the challenges facing the Nation's energy infrastructures. It will review the adequacy, with respect to energy policy, of existing executive and legislative actions, and recommend additional executive and legislative actions as appropriate; assess and recommend priorities for research, development, and demonstration programs to support key energy-innovation goals; and identify analytical tools and data needed to support further policy development and implementation.

The budget request for EPSA is \$38.5 million, an increase of \$22.4 million, to support several key initiatives. The increase primarily funds the crosscutting grid modernization efforts, as well as analytics and modeling in support of DOE's responsibility as secretariat for the government-wide Quadrennial Energy Review.

Indian Energy Policy and Programs

The Office of Indian Energy Policy and Programs (IE) directs, fosters, coordinates, and implements energy planning, education, management, and competitive grant programs to assist Tribes with clean energy development and infrastructure, capacity building, energy costs, and electrification of Indian lands and homes. IE performs these functions consistent with the federal government's trust responsibility, Tribal self-determination policy, and government-to-government relationship with Indian Tribes, and accomplishes its mission through technical assistance, education, and capacity building; research and analysis; and financial assistance to Indian Tribes, Alaska Native Tribes and corporations, and Tribal energy resource development organizations.

The budget request, which provides \$16 million for Indian Energy Policy and Programs as a separate appropriation, reflects the consolidation of our tribal energy programs into a single office.

Science

DOE's science programs provide the technical underpinnings to accomplish the Department's missions and form part of the backbone of basic research in the physical sciences in the United States. Almost 28,000 researchers use Office of Science user facilities each year, and the successful construction and operation of these facilities is central to the economic competitiveness, national security, and scientific leadership of the Nation.

The budget request provides \$5.1 billion for the Office of Science, a 1 percent increase above FY 2014. The request builds upon the Department's strength in the development of large-scale computational capability. The FY 2015 request supports the Office of Science in developing next-generation computational tools—and in applying these tools to many of science's grand challenges, such as climate modeling and computational material science.

In particular, Science will lead, in conjunction with NNSA, research focused on developing capable exascale computing platforms. Maintaining a strong program in high performance computing will be tremendously important to our economic competitiveness and national security, and government-wide coordination of this

effort will ensure that the U.S remains a global leader in high-performance computing for science, defense and industry.

The budget request also supports our ongoing commitment to leading-edge scientific facilities. The request ramps up construction of the Facility for Rare Isotope Beams at Michigan State University, which was dedicated on March 17th. The request also continues construction of the Linac Coherent Light Source II—another example of the many cutting-edge DOE facilities that provide an unparalleled set of research tools to tens of thousands of science users.

In FY 2015, we sustain our commitment to our highly productive Energy Frontier Research Centers and three Bioenergy Research Centers. The budget request also includes funding for the Office of Science's two Energy Innovation Hubs, which focus on batteries and converting sunlight to liquid fuels. I would also note that I have charged the Secretary of Energy Advisory Board to look at how we can evaluate and continue to improve the performance of the Department's Hub model moving forward. The Advisory Board's draft report was released late last month, and I would be happy to discuss its findings once the report is finalized.

Crosscutting Initiatives

Finally, we have identified a number of areas for crosscutting initiatives to tackle common challenges and recognize shared opportunities across multiple DOE offices. I have selected these initiatives because of their potential to be game-changers in energy and security, to add value through collaboration and leveraging DOE's full breadth of research and technologies, and to ensure there is no duplication of effort. These collaborative efforts extend across DOE's programs and National Labs and are designed to leverage the unique, first-class array of facilities and capabilities that exist across the DOE complex.

The grid modernization initiative implements a unified strategy to address institutional and technological challenges to creating a more secure, resilient, and flexible future grid. The initiative enlists the unique strengths and focuses of four offices: OE, EERE, EPSA, and the Office of Congressional and Intergovernmental Affairs.

The subsurface environment is critical to the U.S. for energy production, energy and CO₂ storage, remediation of existing legacy waste, and ultimate disposal of future energy wastes. With the subsurface crosscutting initiative, DOE is bringing together its Science, Fossil Energy, Environmental Management, Energy Efficiency and Renewable Energy, and Nuclear Energy programs into a coherent, coordinated approach to common challenges in characterizing, engineering, monitoring, and controlling subsurface systems in various geologic environments.

The exascale computing initiative continues research and development with our Office of Science and NNSA leading to the implementation of advanced computing systems that will be tremendously productive for science, defense, and our Nation's innovation leadership. An approach coordinated across DOE Offices as well as across the government will help to accelerate that effort. The Department of Energy is part of an interagency effort to optimize investments to sustain our nation's leadership in high performance computing to the benefit of our research capacity, our nuclear security and our industrial base.

Supercritical carbon dioxide (SCO₂) power systems have broad potential for substantially lower-cost, higher-efficiency energy in a number of energy areas. The supercritical CO₂ crosscutting initiative continues related work in renewable energy and fossil energy, and fully-funds a new 10-megawatt supercritical CO₂ technology electric power (STEP) demonstration project in the Office of Nuclear Energy.

Finally, the cybersecurity crosscutting initiative funds activities in four offices—NNSA, OE, Science, and the Chief Information Officer—to strengthen the protection of DOE from cyber-attacks, bolster the Nation's capabilities to address cyber threats, and improve the cybersecurity of the energy sector.

Nuclear Security

The budget request provides \$11.9 billion for our nuclear security missions, a 4 percent increase over FY 2014, in support of national security priorities articulated in the 2010 Nuclear Posture Review, the Stockpile Stewardship and Management

Plan, and the 2010 National Security Strategy of the United States, to secure nuclear materials globally, and to ensure protection of DOE's national security assets.

Weapons Activities

The Department of Energy is responsible for certifying a safe and reliable stockpile without testing, as long as we have nuclear weapons. While budget caps have put difficult constraints on the nation's national security enterprise, the interagency planning process—involving the Department of Defense, Department of Energy, National Security Council, and the Office of Management and Budget—created a revised strategy and budget request that remains committed to the “3+2 strategy” to maintain a safe and reliable stockpile while reducing the numbers and types of weapons in the next two decades.

The FY 2015 budget request for Weapons Activities is \$8.3 billion, a \$534 million or a 7 percent increase over FY 2014, to maintain a safe, secure, and effective nuclear stockpile, and to strengthen key science, technology, and engineering capabilities and modernize the national security infrastructure. The budget request supports the revised strategy to achieve the B61-12 LEP First Production Unit (FPU) by FY 2020 and complete production of the W76-1 warhead by FY 2019. The strategy defers the W78/88-1 Life Extension Program by five years, achieves the W88 ALT 370 FPU in the first quarter of FY 2020, and delays the Long-range Standoff warhead by three years to 2027, while evaluating the option for a future budget request. Under the strategy, the budget continues engineering design for the Uranium Processing Facility into FY 2015, and it continues to support the Nation's current and future defense posture and its attendant nationwide infrastructure of science, technology and engineering capabilities. We are also continuing to make the investments necessary for maintaining continuity of plutonium capability at Los Alamos National Laboratory while reducing safety risks in the Chemistry and Metallurgy Research Facility and PF-4.

The budget request also includes funding for Defense Nuclear Security (DNS) to support DOE's physical security reform efforts emphasizing mission performance, responsibility, and accountability. The request also provides funding within

Weapons Activities to sustain emergency response and nuclear counterterrorism capabilities that are applied against a wide range of high-consequence nuclear or radiological incidents and threats.

In short, the budget request continues to support interconnected critical life extension programs; rebuilding of infrastructure; and the continuation of the science and engineering base that we will need in the long run for certification of the nation's stockpile.

Defense Nuclear Nonproliferation

The Defense Nuclear Nonproliferation (DNN) FY 2015 budget request is \$1.6 billion, a \$399 million reduction from FY 2014. The Office of Defense Nuclear Nonproliferation continues to support U.S. leadership in nonproliferation initiatives both at home and abroad that increase global nuclear security. While we will continue to support a very robust program, the DNN budget reflects a substantial reduction, which is a result of difficult choices within our prescribed budget caps. Further, more than half of the reduction to DNN's budget is due to reduced funding for the Mixed Oxide Fuel Fabrication Facility.

DNN has had many successes in recent years. Since the President laid out his nuclear security agenda in 2009, DOE's Office of Defense Nuclear Nonproliferation (DNN) has removed or confirmed the disposition of over 3,000 kilograms of highly enriched uranium – enough material for more than 100 nuclear weapons. These removal activities have resulted in eleven countries plus Taiwan becoming HEU-free. DNN has also overseen the downblending of roughly 13 metric tons of surplus U.S. HEU, and cooperated with Russia in the downblending of about 2 metric tons of Russian HEU. I have just returned from the Nuclear Security Summit in The Hague where the U.S. and Japan announced a program to remove hundreds of kilograms of HEU from Japan's Fast Critical Assembly.

After the conclusion of a four-year accelerated effort, the budget request supports continued efforts to secure or eliminate the world's most vulnerable nuclear weapon materials. The Global Threat Reduction Initiative will continue to convert or shutdown HEU reactors, remove vulnerable HEU and plutonium, and protect

additional buildings containing high-priority materials. The research and development program will continue to improve capabilities in nonproliferation and foreign weapons program activity monitoring.

The Fissile Material Disposition program remains a vital commitment. However, as part of an ongoing analysis of options to dispose of U.S. surplus plutonium, it has become apparent that the Mixed Oxide (MOX) Fuel Fabrication Facility will be significantly more expensive than anticipated, and therefore, the budget request places the MOX Facility in cold stand-by while the Department evaluates plutonium disposition options. While we remain committed to the disposal of the 34 metric tons of weapons plutonium, we must go into a standby mode while we look at the full range of options.

Naval Reactors

The Office of Naval Reactors supports the U.S. Navy's fleet of aircraft carriers and submarines by maintaining its unique infrastructure and advanced naval nuclear capabilities. The FY15 budget includes funding for Naval Reactors operations at four Program sites including two laboratories, two operating prototype training reactors and spent fuel handling operations

Naval Reactors' request for FY15 is \$1.4 billion, an increase of 26 percent (\$263 million) over FY 14 spending levels. The increase is critical to ensuring maintenance of the high standards required to operate the U.S. Navy's nuclear-powered Fleet and executing its National Security mission. It further funds research, development, engineering and testing required to support operating and future nuclear powered warships.

The Program is advancing the design of the life-of-ship core for the OHIO-class Replacement submarine and meeting scheduled milestones for manufacturing and development efforts being performed as part of the Land-based Prototype Refueling Overhaul. Naval Reactors continues conceptual design for recapitalizing its spent fuel handling facility in Idaho. The facility is critical to meeting the Navy's aircraft carrier refueling schedule.

NNSA Federal Salaries and Expenses

The FY 2015 budget request includes \$411 million for NNSA Federal Salaries and Expenses, formerly the Office of the Administrator, to support the staffing and Federal support needed to meet mission requirements. The \$33 million increase over FY 2014 primarily results from the congressionally-directed transfer of Corporate Project Management and \$20 million to move the Albuquerque Complex to a different leased facility.

Management and Performance

The FY 15 budget request provides \$6.5 billion for management and performance programs, to support efforts to manage more effectively and to meet our legal and moral obligations to clean up nuclear waste from the Cold War. As mentioned, a suite of efforts supported by the budget aim to improve how effectively we carry out our missions for the American people.

The budget request moves responsibility for the Environmental Management program from the Under Secretary for Nuclear Security into a mainline responsibility for the Management and Performance Under Secretary in order to improve departmental management and execution of some of our most technically-complex cleanup missions. We are currently implementing a reorganization to establish an enterprise-wide approach to health, safety and security that improves both execution and accountability. We continue to support diversity, small businesses, and Native Americans across activities at the Department.

We are pushing forward initiatives to improve the strategic partnership with the National Laboratories including by establishing a National Laboratory Policy Council and a National Laboratory Operations Board to address strategic and management issues with leadership from the Department and the Laboratories. We are also working to improve delivery and reduce the cost of human resource functions and IT services, to strengthen management through new cyber and incident management councils, and to institutionalize more effective enterprise-wide project management by convening a senior-level working group with representatives from across the Department.

Environmental Management

The Environmental Management (EM) program is responsible for the cleanup of millions of gallons of liquid radioactive waste, thousands of tons of used nuclear fuel and special nuclear material, and large volumes of transuranic, mixed, and low-level waste and contaminated soil and water. The program also supports the deactivation and decommissioning of thousands of excess facilities across the complex.

The EM Program has achieved a number of recent successes. To provide just a few examples, the program has completed cleanup at 91 of 107 sites across the country and significant portions of the remaining 16 sites. Sites that once housed large industrial complexes, like Rocky Flats in Colorado and Fernald in Ohio, are now wildlife preserves. In December 2013, EM closed two additional radioactive waste storage tanks at the Savannah River Site, a major milestone that brings the total number of tanks closed to six. At Oak Ridge, EM recently completed demolition of the K-25 facility, a mile-long, facility that was once the world's largest building under one roof. EM has decommissioned and demolished another 2 million square feet of excess facilities at the Idaho National Laboratory. And at Los Alamos National Laboratory, EM is on track to meet its commitment to complete the removal of all above-ground combustible transuranic waste by the end of June, despite the temporary closure of Waste Isolation Pilot Plant.

The FY 2015 budget request provides \$5.6 billion for Environmental Management to meet the Nation's legal and moral imperatives for environmental remediation at DOE sites. The budget request continues to support cleanup progress at 16 sites across the DOE complex, including continued progress on environmental management of the former uranium enrichment facilities at Oak Ridge, Portsmouth, and Paducah. EM has successfully completed many cleanup projects. What remains are some of the most complex cleanup efforts.

For example, the request supports continued construction of the Hanford Waste Treatment and Immobilization Plant (WTP) and efforts to resolve the project's remaining safety and technical challenges. Consistent with the Department's

revised option for WTP, which is designed to move the WTP toward immobilization of waste as soon as practicable while resolution of technical issues continues, the FY 2015 budget includes support for analysis and preliminary design of a Low Activity Waste Pretreatment System. This approach demonstrates a commitment to complete the Waste Treatment Plant in a realistic and sustainable way. This will give Congress and the affected communities' stronger confidence in the Department to get the job done. We will also continue making tank waste cleanup progress at Savannah River and Idaho.

The Budget also proposes \$172 million for Legacy Management (LM), the final element of site remediation and closure after active remediation is complete. LM fulfills the Department's commitments to ensure protection of human health and the environment and ensure all contractual obligations are met.

Conclusion

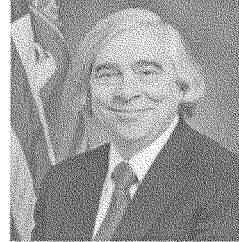
The Department of Energy's FY 2015 budget request will allow it to deliver the innovative and transformative scientific and technological solutions to energy, security, economic, and environmental challenges facing the United States in the 21st century.

Through its Science and Energy programs, the budget request will further the President's Climate Action Plan to cut carbon pollution while reducing America's dependence on foreign oil and will support an all-of-the-above energy strategy. The budget request for Nuclear Security programs will advance the President's vision for reducing the levels of nuclear weapons in the world, strengthen nonproliferation efforts, and combat nuclear terrorism. Finally, the request for Management and Performance programs will allow DOE to address the legal and moral imperative of cleaning up legacy nuclear waste and to better manage our programs on behalf of the American people.

Thank you, and I would be pleased to answer your questions.

Dr. Ernest Moniz - Secretary of Energy

As United States Secretary of Energy, Dr. Ernest Moniz is tasked with implementing critical Department of Energy missions in support of President Obama's goals of growing the economy, enhancing security and protecting the environment. This encompasses advancing the President's all-of-the-above energy strategy, maintaining the nuclear deterrent and reducing the nuclear danger, promoting American leadership in science and clean energy technology innovation, cleaning up the legacy of the cold war, and strengthening management and performance.



Prior to his appointment, Dr. Moniz was the Cecil and Ida Green Professor of Physics and Engineering Systems at the Massachusetts Institute of Technology (MIT), where he was a faculty member since 1973. At MIT, he headed the Department of Physics and the Bates Linear Accelerator Center. Most recently, Dr. Moniz served as the founding Director of the MIT Energy Initiative and of the MIT Laboratory for Energy and the Environment and was a leader of multidisciplinary technology and policy studies on the future of nuclear power, coal, nuclear fuel cycles, natural gas, and solar energy in a low-carbon world.

From 1997 until January 2001, Dr. Moniz served as Under Secretary of the Department of Energy. He was responsible for overseeing the Department's science and energy programs, leading a comprehensive review of nuclear weapons stockpile stewardship, and serving as the Secretary's special negotiator for the disposition of Russian nuclear materials. From 1995 to 1997, he served as Associate Director for Science in the Office of Science and Technology Policy in the Executive Office of the President.

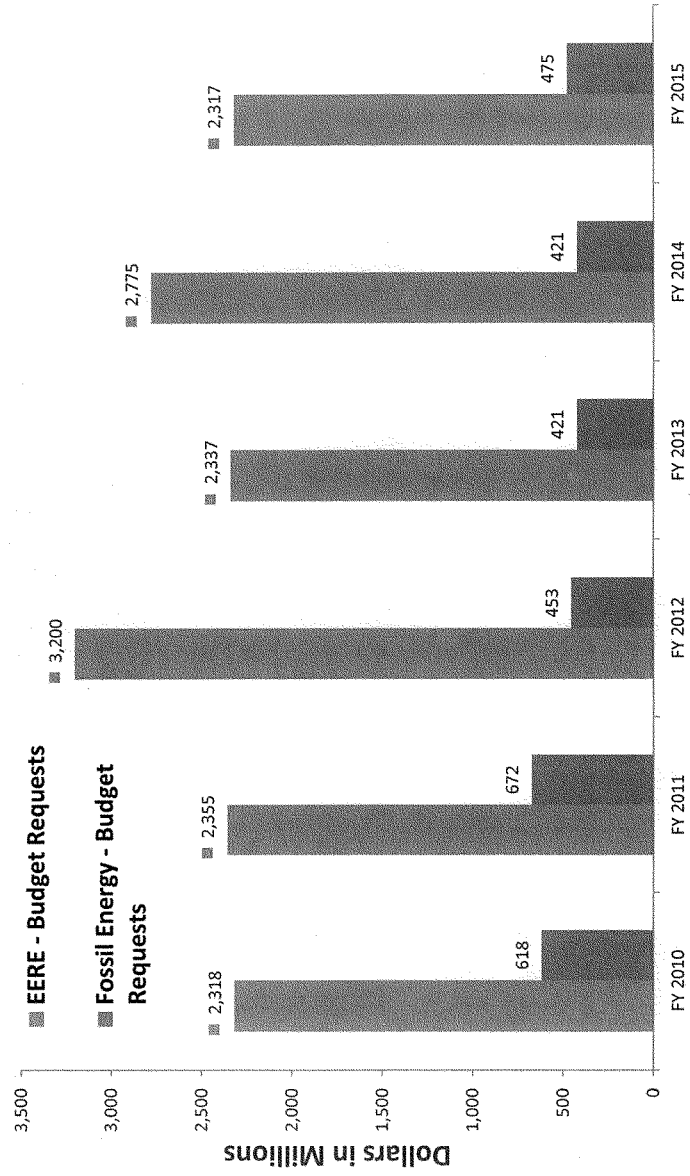
In addition to his work at MIT, the White House, and the Department of Energy, Dr. Moniz has served on a number of boards of directors and commissions involving science, energy and security. These include President Obama's Council of Advisors on Science and Technology, the Department of Defense Threat Reduction Advisory Committee, and the Blue Ribbon Commission on America's Nuclear Future.

A member of the Council on Foreign Relations, Dr. Moniz is a Fellow of the American Association for the Advancement of Science, the Humboldt Foundation, and the American Physical Society.

Dr. Moniz received a Bachelor of Science degree *summa cum laude* in Physics from Boston College, a Doctorate in Theoretical Physics from Stanford University, and honorary degrees from the University of Athens, the University of Erlangen-Nuremberg, and Michigan State University.

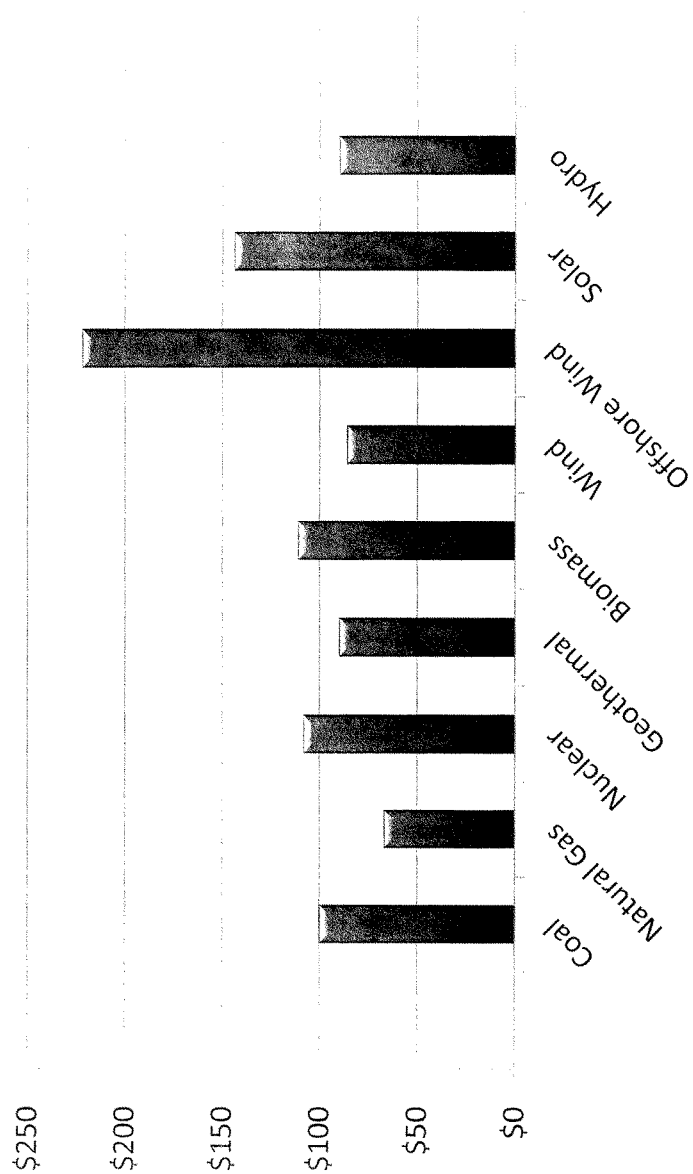
Chairman SMITH. Okay. Thank you, Secretary Moniz, and I will recognize myself for questions.

My first question goes to what you just mentioned and which the Administration has stated many times and that is that they have this balanced, all-of-the-above energy strategy. What I would like to do is put a chart on the screen for us to take a look at, and this chart will show the budget request by the Obama Administration since 2010.



Cost of Electricity

EIA levelized estimates in \$ per MWH



http://www.eia.gov/forecasts/aeo/electricity_generation.cfm

Chairman SMITH. No one can read the fine print here, but let me interpret it for you. The blue bars indicate the request by the Administration for alternative forms of energy, and the red is the budget request for fossil energy. And it certainly appears to me to not be a balanced approach of all-of-the-above energy policy by the Administration when you have this kind of discrepancy between the money that the Administration is requesting for alternative forms of energy versus fossil energy. Would you agree with that assessment?

Secretary MONIZ. Well, Mr. Chairman, I believe that our requests do reflect all-of-the-above approach, and we are committed to fossil fuels, nuclear, renewables and efficiency. May I make two points? One has already been referred to by the Ranking Member, namely that of course, if you look at something like fossil, there are enormous resources in the demonstration and deployment arena with \$6 billion for carbon capture and sequestration——

Chairman SMITH. Right. Secretary——

Secretary MONIZ. —that I——

Chairman SMITH. —Moniz, let me pull you back to the actual budget request by the Administration, and almost every year, I guess in every year, the amount of money requested by the Administration for alternative forms of energy is somewhere between three and six times more than for fossil. And to me, just looking at that and trying to be factual and objective, and I know you have a reputation for that, it sure doesn't seem like a balanced all-of-the-above energy policy to me.

Secretary MONIZ. And my second point, after the issue that we do have these major other investments that are still in process, but I think when we look at EERE, we should really recognize that it is two or three really distinct programs.

Chairman SMITH. Okay.

Secretary MONIZ. Our energy efficiency——

Chairman SMITH. You just don't want to look at my budget chart here.

Secretary MONIZ. No, no. No, sir.

Chairman SMITH. Oh, okay.

Secretary MONIZ. No, I would love to see it back up because——

Chairman SMITH. Okay. Let us put the budget chart back up.

Secretary MONIZ. I prefer looking at the——

Chairman SMITH. Again, the blue is the alternative, the red is the fossil.

Secretary MONIZ. Yes. So what I am saying is that blue bar, the 2.3 billion on the right——

Chairman SMITH. Right.

Secretary MONIZ. —I think we should relook at it as there is a \$953 million request for energy efficiency.

Chairman SMITH. Right.

Secretary MONIZ. There is a \$579 million request for renewable energy, and there is a \$780 million request for sustainable transportation. And I would argue those are three fairly distinct programs which are in fact pretty comparable with nuclear and fossil requests.

Chairman SMITH. Right. Well, we left out nuclear which was just marginal as you know.

Secretary MONIZ. Nuclear is 863.

Chairman SMITH. Right. Compared to what we spend for alternative forms of energy, I think there is just no comparison whatever you look at, and that is the disappointment and that is why I think that it is not to me, at least, a balanced, all-of-the-above energy program by the Administration.

Let me go to my next question real quick and squeeze it in, and this is just again, I don't know the answer. I hope you do. How much funding remains, because we couldn't tell from your website—, how much funding remains for loan guarantees and will there be additional loan guarantee this year?

Secretary MONIZ. On the loan guarantee program, first of all, it is about \$32 billion that has been deployed, and there is approximately \$24 billion of authority left in the 1703 program—

Chairman SMITH. Right.

Secretary MONIZ. —and approximately \$16 billion of authority left in the advanced vehicle technology program.

Chairman SMITH. And do you expect any additional loan guarantees to be approved this year?

Secretary MONIZ. Well, approval is a little bit hard because there is a very, very long due diligence process. But we are actively in process. As you know, we have the fossil one out.

Chairman SMITH. Right.

Secretary MONIZ. We plan to issue another call in the renewables and efficiency space, potentially nuclear as well, and just last week I met with the auto suppliers to point out that that program remains open.

Chairman SMITH. Let me go to my last quick question. I hope none of those loan guarantees are for offshore wind because on the chart that you are going to see here, the cost of offshore wind is about 2-1/2 times the cost of on-shore. And not only that, offshore wind is by far the most expensive form of energy. And it just seems to me that when we are talking about limited dollars and we have to set priorities, we wouldn't want to spend the taxpayers' dollars on a form of energy, which is to say, offshore, not on-shore wind that costs so much compared to other forms of energy. Do you want to make a comment about that?

Secretary MONIZ. Well, first of all, in the spirit of investing in future technologies, our R&D request in renewables has a strong offshore focus. So that is the first point. The second point is if and when there are loan applications for offshore wind, we will go through the extensive due diligence—

Chairman SMITH. Right.

Secretary MONIZ. —to make sure that there is a very high probability—

Chairman SMITH. Why put a single dollar in a form of energy that is the most expensive form of energy and they cost 2-1/2 times as much as on-shore wind? I just don't understand the rationale. If you have unlimited funds, maybe you do something. But if you don't have unlimited funds, why wouldn't you put the money in the most efficient types of energy production?

Secretary MONIZ. Well, again, this is a portfolio of the whole, the R&D portfolio, the loan portfolio. It is about technologies that are relatively short term, mid-term and long term.

Chairman SMITH. Okay.

Secretary MONIZ. Clearly on offshore wind, it is a fact that the current price per kilowatt hour—

Chairman SMITH. Right.

Secretary MONIZ. —has got a ways to go to become commercially—

Chairman SMITH. Well, I don't see how you ever overcome the natural additional costs associated with offshore wind, whether it is short, medium or long term. I know you believe in facts. I know you believe in data. And I just hope you will spend the taxpayers' dollars on where the most efficient means of producing energy is, and the least efficient is offshore wind, at least according to current data.

Thank you for responding to my questions, and the gentlewoman from Texas is recognized for hers.

Ms. JOHNSON OF TEXAS. Thank you very much, Mr. Chairman. On your chart, there are several categories here listed, research in the blue compared to just one category with the fossil. If we—we have been served very well by fossil energy, but if we don't move from fossil energy to all-of-the-above or other alternatives, I want to ask the Secretary, are we running the risk of not having enough energy for the people on this planet if we just depend on fossil fuels?

Secretary MONIZ. Well, obviously fossil fuels are by definition finite. We still have a lot to produce, but I think the real issue—in my view, the question is do we have enough atmosphere to accommodate using all fossil fuels, for example, be it in conventional pollution or carbon dioxide? So clearly fuel diversity is very important. That includes bringing nuclear, renewables and of course efficiency, along with fossil, but our investments are still aimed at fossil for a future low-carbon environment.

Ms. JOHNSON OF TEXAS. And in looking toward the future it would make sense then to put some of the investment in all the other research areas other than just fossil?

Secretary MONIZ. Absolutely, very substantially. These will play increasingly important roles.

Ms. JOHNSON OF TEXAS. Thank you very much. Now, I know that in a tough budget environment that you have got to make tough decisions. But in the Office of Science, can you provide a clearer explanation for the proposed funding level and if there is some discretion about which the Office of Science beyond the Department's request level can have access to some additional resources?

Secretary MONIZ. Well, it is clear that you have already given the most important part of the answer which is it is a very constrained environment with essentially flat dollars for discretionary spending on both sides of the agenda, civilian and military, and we faced both of those constraints I might say. On the civilian side, we had to make choices. We believe the science program at \$5.1 billion is very robust. Could we do more? We could accelerate for example our development of new facilities, but I do note in the budget, for example, our light sources, our neutron sources, will be very heavily utilized with this budget, and at the same time, moving forward to build new capabilities like the Free Electron Laser (FEL) project

at SLAC, the new accelerator at Michigan State. So I do think we will be moving forward.

We also are recompeting Energy Frontier Research Centers. So it will be a strong budget. Clearly, if there were more funds, the science enterprise could certainly be even more robust.

Ms. JOHNSON OF TEXAS. Thank you. Now, there are times when I hear a lot about my colleagues talking about picking winners and losers and interfering in the free market by crowding out private investment. But frankly, I don't understand the argument too well. So I am hoping you can help. Should the government support all research proposals and areas equally or should it prioritize investments based on where we can get the most value for our tax dollars? That is question one. And number two, has the Department actually picked a lot of important winners in the past decades such as breakthrough of the hydraulic fracturing technology or is that a bad thing?

Secretary MONIZ. Well, certainly again we believe in a broad set of investments, but within that obviously one is choosing areas within budget constraints for greater emphasis at any given time depending on the opportunities. You have mentioned hydraulic fracturing, for example, where the Department made the initial investments in the '79-'80 timeframe, and I might say, that was the seed, but then it was picked up by a public-private partnership. In that case it was a FERC administered surcharge on interstate gas transmission, industry-matching funds and a Congressional tax credit, all of which came to facilitate developing the unconventional.

In this budget, for example, we don't know. Maybe we will have the next unconventional revolution. We have put in for \$15 million to build our methane hydrates program which could be the next one in the future.

Ms. JOHNSON OF TEXAS. Thank you. My time has expired.

Chairman SMITH. Thank you, Ms. Johnson. The gentleman from California, Mr. Rohrabacher, is recognized for his questions.

Mr. ROHRABACHER. Thank you very much. Mr. Secretary, do you believe that we will be soon to have at least a prototype of a small modular nuclear reactor that is not based on light water, the light water reactor concept?

Secretary MONIZ. There—by the way, I might say I am certainly very interested in small modular reactors, of both light water and non-light water types.

Mr. ROHRABACHER. Light water is the old technology—

Secretary MONIZ. Right.

Mr. ROHRABACHER. —that we've used so far—

Secretary MONIZ. So—

Mr. ROHRABACHER. —so far.

Secretary MONIZ. Right. So—

Mr. ROHRABACHER. Can we get a new type of technology in small modular reactors?

Secretary MONIZ. Certainly we can, and I think it is a direction we need to move in. But let me explain that certainly today, as you know, the one award that is made and the tentative award that has been made are both light-water reactor types. The issue there is that—this is at least my view in supporting that as the first

focus area, is that if one looks at the retirements of current nuclear reactors, there have been a few now. But the major retirement wave, assuming 60-year lifetimes, really starts in 2030. In talking to utility executives who are interested in nuclear, they say we have got to make our kind of capital planning decisions in the 2024, 2025 timeframe. Even on light water reactors, small modular reactors, we don't think we will have the first one out there until 2022, 2023.

Mr. ROHRABACHER. I know and——

Secretary MONIZ. So——

Mr. ROHRABACHER. —that is what I would like to suggest that is an improper priority. The fact is the light water reactors are inherently dangerous. The environmentalists in past decades, they were right about that. There are dangerous light water reactors. There is no reason for us to be moving forward at a slow pace on the development of these small modular reactors that are not light water reactors.

And another area just to call your attention to, the success that we have had with stationary, manufactured stationary fuel cells in California, that seems to be really taking off. It is an enterprise that has a lot of promise, and I understand there is something called a turbo fuel cell that actually would make—it is a hybrid concept in which we would have the cleanest way of utilizing this massive amount of new natural gas that we have. Have you looked into that at all, the turbo fuel cell?

Secretary MONIZ. In fact, if I—maybe one SMR comment, just very briefly——

Mr. ROHRABACHER. Sure.

Secretary MONIZ. —is that I would say that these new reactors, they are integral reactors, and I think they have some excellent safety features. On the turbo fuel cell, I can't say I have looked at that directly, but it sounds like something I probably should.

Mr. ROHRABACHER. I would encourage you to do that.

Secretary MONIZ. But I think in general, this issue of these hybrid systems are very, very interesting, and this for example could be something, if it is moving toward commercialization, that could qualify in our fossil loan guarantee program because hybrid systems are——

Mr. ROHRABACHER. Right.

Secretary MONIZ. —called out.

Mr. ROHRABACHER. Well, thank you. I would like to draw your attention to that. I appreciate that.

Secretary MONIZ. I appreciate that.

Mr. ROHRABACHER. One last area and that is how much of today's domestic oil production can be attributed to the Alaskan pipeline?

Secretary MONIZ. Well, I don't know in detail, but of course we know that production right now in Alaska has been going down somewhat after its peak in the '70s.

Mr. ROHRABACHER. Right.

Secretary MONIZ. And right now, the major development, the Eagle Ford shale and the Bakken shale——

Mr. ROHRABACHER. Right. Well——

Secretary MONIZ. —have been the main——

Mr. ROHRABACHER. But for the last 25 years, the American economy has greatly benefitted, has it not, from the Alaskan pipeline? And just to draw your attention again, there was a huge fight over the Alaskan pipeline. It almost didn't get approved, and I think it was approved by one vote, one vote, and the Senate I believe carried that project. Without the Alaskan pipeline, our economy would have been severely damaged. The well-being of the American people would have been hurt. Now, wouldn't we expect that if we don't have the Keystone pipeline that the American people will also suffer the consequences?

Secretary MONIZ. Well, on the first point, let me just note that the Alaskan pipeline had the feature—of course, it was very—I believe really very important to the American and of course the Alaskan economies. But it had the feature of opening up a resource that otherwise had no access to market.

Mr. ROHRABACHER. Well, the environmentalists made all sorts of arguments against it at that time. Did any of those arguments proven true after the pipeline went into effect and has been providing us the oil? Were any of those dire predictions come true?

Secretary MONIZ. Well, I am not aware of dire consequences, although I must say—

Mr. ROHRABACHER. Well, the—

Secretary MONIZ. —neither am I completely familiar with the environmental reference completely.

Mr. ROHRABACHER. Sure, the caribou was going to disappear, the tundra was going to melt. We had so many, I mean, Alaska was going to be totally changed in its environment. None of those dire consequences happened, did they?

Secretary MONIZ. Not to my knowledge, but again, I am hardly expert in that—

Mr. ROHRABACHER. So perhaps the Keystone—

Secretary MONIZ. Right

Mr. ROHRABACHER. The complaints on the keystone pipeline might be of the same kind of charge. Thank you very much, Mr. Chairman.

Chairman SMITH. Thank you, Mr. Rohrabacher. The gentleman from Illinois, Mr. Lipinski, is recognized for his questions.

Mr. LIPINSKI. Thank you, Mr. Chairman. Secretary Moniz, I want to thank you for your leadership at the Department. The first thing I wanted to raise with you is the Department's management of the Technology Commercialization Fund. My understanding is that for two years after it was set-up in the Energy Policy Act of 2005, the TCF was used to provide technology maturation funds to national labs but has been used for other purposes since that time. While I prefer the original approach, I think what we need is a forward-looking plan for how the TCF is going to be operated that will enhance the technology transfer mission at DOE. I think this is something that is very important.

I have worked with the Committee and DOE to put language into the Democratic COMPETES Reauthorization Act that would ask DOE for recommended policy changes. I understand work is currently ongoing to develop a plan. So I want to thank you for your work on this so far and ask you is there any update you can

give us on how the planning process is going or what DOE's vision for the TCF will be moving forward.

Secretary MONIZ. Thank you. I think first of all the key is, and I will admit to it having been a frustration. The key is filling our technology transfer coordinator position with a very, very strong and I would say visionary person. We are I believe on the verge of finally succeeding in that, and this person will play of course a significant role in addressing your question directly.

Secondly, we have raised this very directly with our Laboratory Policy Council. So with the lab directors and our senior leadership in DOE we are specifically developing a plan around technology transfer. Again, it has been somewhat impeded by our unfilled position, but that will be corrected I believe within weeks. I feel confident this time that we will get past the finish line.

And finally, our Secretary of Energy Advisory Board, SEAB, is just forming a task force around a variety of laboratory governance issues, and technology transfer is one of those. So I think finally we are marshalling the resources we need. To be able to answer your question, I ask for a little more patience, and we will stay in touch.

Mr. LIPINSKI. Okay. Well, I just want to emphasize the importance of that is—I have before, and thank you for that. And anything that we can do up here certainly to help move that forward, you know, we will be happy to do that.

Next question, as you know, several of our national labs, including Argonne, which is in my district, have legacy nuclear waste on site. Currently labs are using overhead dollars to manage the waste on site, but given that we may not see large budget increases in the future, these overhead dollars are precious for the labs. Does the Department have any plans to characterize and package the waste so that overhead funds could once again go towards furthering the scientific mission of the labs which, as I said, with the tight dollars we have right now, this would become increasingly a major issue for many labs including Argonne?

Secretary MONIZ. This remains a challenge, and the entire environmental management issue across the Department is also like other things up against these tight budget caps, in this case in particular in the so-called 050 account. Now, for perspective, I believe EM has closed out close to 90 percent of the requirements on managing legacy waste, but of course, there is still a lot to do in this business, including many of the hardest projects.

With regard to the labs, all I can say is we are trying to move on that. I have to admit, I don't know the Argonne situation as well as some others that are somewhat larger in scale. For example, in Los Alamos right now, we have had to move some transuranic waste urgently because we are concerned about the next fire, wild-fire season coming up, and we are trying to get everything out there.

So we are trying to prioritize and move, and I understand the frustration and the challenge on the lab budgets. I might also just add, I think with Argonne, as you know, we have just announced a new director, and I think it is an outstanding choice.

Mr. LIPINSKI. Thank you. And again, I want to thank you for your work, and continued work on these particular issues. With that, I will yield back.

Chairman SMITH. Okay. Thank you, Mr. Lipinski. Before I recognize the Chairman Emeritus, Mr. Hall of Texas, I just want to say to Members, we are expecting one vote to come up momentarily, and if a couple of Members on either side want to go vote right now, we are going to continue the hearing during votes, and a Member is on the Floor now who will come back and relieve me. So that way we will be able to squeeze in perhaps three or four Members and their questions. I don't want everybody to get up and leave because we need people to ask questions for the next few minutes. But if someone wants to go, then they will be in line immediately after the vote.

The gentleman from Texas, Mr. Hall, is recognized for his questions.

Mr. HALL. I still have my full time, right?

Chairman SMITH. Yes, you do.

Mr. HALL. Thank you, Mr. Chairman, and I want to thank you, I really do want to thank you for holding this hearing on what is probably one of the most important words in the dictionary, especially to youngsters 18 years old, high school, college graduates, and that word is energy. Other than prayer or grace, it is probably the most important word in the dictionary.

Mr. Secretary, this is the second opportunity I have had to hear from you. Last week you appeared before Energy and Commerce, and we are pleased to have you here today to report on science and technology priorities at the Department of Energy.

Mr. Secretary, you are one of the few, maybe I am not putting that correct, but you are one who knows something about Section 999 of the Energy Policy Act of 2005, right?

Secretary MONIZ. I do, indeed.

Mr. HALL. It established an unconventional oil and gas research program. Actually, to put it plain, we had energy at the bottom of the ocean ultra-deep that we couldn't get up, and we traded for technology to get it up and paid for it with the energy that we got up, not at the taxpayers' expense. And that is what sold it and that is what makes it good still today. And it has been battered around, hammered, but it is still alive. So I want to ask you some questions about it.

As you know, this program has funded a wide range of very successful projects that have developed new technologies and processes to mitigate potential environmental impacts and improve energy production efficiency. First, A, let me ask you, what are your thoughts on Section 999 program?

Secretary MONIZ. Well, I believe the program, as you said, has done a very, very good job in terms of its R&D support, very, very strong university participation, very strong industry matching funds in ultra-deep water, unconventional gas and small producer problems.

Mr. HALL. And how did the program fit in with an "all-of-the-above" strategy that our country needs and this Administration claims to support?

Secretary MONIZ. Well, many of the programs supported and those also that we proposed in our natural gas technology section are addressing the environmental challenges——

Mr. HALL. And I am pleased it stays supported.

Secretary MONIZ. —of producing—yes.

Mr. HALL. Can you tell us why the public-private partnership approach worked so well for this program?

Secretary MONIZ. Well, I am a big fan of public-private partnerships in general. This program, again, it worked well. I think it provided stability because of the revenue stream for the industry to feel confident in investing in matching funds for longer term projects.

Mr. HALL. And the real-world research accomplishments of the program?

Secretary MONIZ. I think it was, again, a very, very good program, many very positive things.

Mr. HALL. Mr. Secretary, the fairly recent and dramatic increase in natural gas and oil production that has resulted from hydraulic fracturing and horizontal drilling have been great for the country from an energy supply and employment perspective. These new technological and energy advancements bring with them new challenges such as water, and other resources, management, well production, efficiency improvement, minimization of methane emissions and understanding and protecting against other activities. What do you think is the best way to understand and manage these challenges? And it has been challenged ever since it passed, even by governors that signed it.

Secretary MONIZ. Well, again, in general, I think the programs including public support and public-private partnership, especially for looking at the environmental impacts of frontier hydrocarbon production are critical, and I think there are many mechanisms for doing that.

Mr. HALL. And I will ask you a real quick question. I think I know what your answer is. Would it better to have a purely government program or an R&D program that combines public and private experience, knowledge and funding?

Secretary MONIZ. Well, I think, again, in this area in particular, I think public-private partnership is the way to go, and that can be—our own programs require, for example, matching funds.

Mr. HALL. Tell us why the public-private partnership approach works so well for this program.

Secretary MONIZ. Well, again, I think it is more general. I think the way these work is industry has a major role in defining the research agenda, but then many other players, including universities and our national laboratories, are the performers of the research.

Mr. HALL. I will have other questions that I will send to you, but I thank you for it. Would you like to do more cross-cutting programs like this program?

Secretary MONIZ. Absolutely. I think cross-cutting programs and public-private partnership is a key to some significant progress.

Mr. HALL. I have 1 second to yield back. Thank you.

Chairman SMITH. Thank you, Mr. Hall. The gentlewoman from Oregon, Ms. Bonamici, is recognized.

Ms. BONAMICI. Thank you, Mr. Chairman. Secretary Moniz, welcome back, and thank you for your expertise, your hard work at the Department of Energy and the wealth of knowledge you bring to these hearings.

I wanted to mention, you said something about a new framework for the Hanford clean-up, and as someone who represents the State on the other side of the Columbia River, thank you. We look forward to getting updates on how that is going.

Before I move onto my questions, I want to simply go on record as stressing the importance of continued robust funding for the Office of Science. On this Committee as well as on the Education Committee, one of the challenges we frequently discuss is how to make sure that young people are interested in going into the STEM fields. I just had a student in my office who is engaged in post-graduate work on high energy physics, and he was first inspired to go into the field when he learned about the LHC and the search for the Higgs-Boson particle. That project enjoys contributions from a host of partners, including the Department of Energy, and these investments are important to advance science but also to inspire young people to go into science. So that is a continued investment that is important.

On that note, another important investment is in the STEM workforce. It is developing educators who can inspire our youth to pursue a career in the STEM fields. So I was a bit concerned that the budget for Workforce Development for Teachers and Scientists within the Department of Energy is facing a decrease, and can you briefly comment on what the Department is doing to promote STEM learning through other initiatives with that cut?

Secretary MONIZ. Well, thank you. A couple of comments, and I will look more carefully at those issues in terms of our distributed programs for dealing with teachers, et cetera, because a lot of it does happen without explicit budget recognition, for example, through our laboratories. But a couple of points: One is I think as you know, the Administration is continuing a process of trying to consolidate a number of these programs, and so we will be working with the new NSF director, for example, trying to make sure that the DOE needs are in fact reflected fully. A second point I will just make. It is not quite on this, but it is related, is that in this budget, it is not a huge amount of funding, but we want to move forward with the Office of Science as the guiding light to institute perhaps you might call experiment, with some NIH-like traineeships. So distinct from fellowships or research assistantships, traineeships focused on specific areas of national need for human resources relevant to energy.

Ms. BONAMICI. Terrific. Thank you. And I want to move on because I have a couple more questions. I wanted to ask about another budget decrease that is proposed, and that is a 25 percent cut for marine and hydrokinetic renewable energy research and development. We have a lot of potential on the coast. There is the Northwest National Marine Renewable Energy Center that has benefited from the DOE's water power program. There is some nascent technology that holds great economic promise, of course, with the exploration of wave energy and the development of wave energy devices.

So I am a little concerned about that cut, but I saw that the Energy Efficiency and Renewable Energy budget was increased. So without strong Department of Energy involvement, I am concerned that the water power industry won't progress at the pace they need to. So can you please comment on that? And I want a little time for one more quick question.

Secretary MONIZ. Quickly, first of all, the water power office budget was put in for an increase, but what happened was there was a rebalancing toward things like microhydro and a new stream reach, et cetera, with the idea that that may have shorter term commercialization. However, let me be completely straightforward. In a number of hearings, I have heard this concern over the marine kinetic program, and we will be happy to engage that discussion and look at—

Ms. BONAMICI. Terrific.

Secretary MONIZ. —a possible rebalancing.

Ms. BONAMICI. Great. We would prefer that our businesses don't have to go to Scotland to test their technology. And speaking of foreign competition, I have in my district the U.S. headquarters of Solar World, and they have had ongoing concerns about China flooding the market with panels. There is a serious concern about how that creates a playing field that is not level. So as we continue to look at ways to promote the implementation of clean energy technology at a price that is cost competitive with traditional fossil energy, can you discuss the trade-off between cheaper solar power today and the cost of potential dependency on Chinese manufacturers in the future?

Secretary MONIZ. Well, there is some trade-off there, but of course, we would like both. As you know, there are trade cases that we have brought in the WTO framework, and I believe that we are still very, very strong in our supply chain, polysilicon, for example. And of course, as we know more generally, manufacturing is coming back to the United States. So we want to help make sure we are competitive in multiple dimensions, including I might add, the manufacturing initiatives that have broad application. For example, the very first manufacturing hub, we put in funding with the Department of Defense to advance 3-D printing. That may have implications for solar and other industries down the road. Oh, and also, our second one, I am sorry if I may add—then our second one that we funded entirely is on power electronics which of course is very important for the balance of systems in a solar panel.

Ms. BONAMICI. Right, and my time is expired. Thank you very much, Mr. Chairman. I yield back.

Chairman SMITH. Thank you, Ms. Bonamici. The gentleman from Texas, Mr. Naugebauer, is recognized.

Mr. NAUGEBAUER. Thank you, Mr. Chairman, and thank you for holding this very important hearing. Secretary Moniz, obviously you have been in a number of budget hearings the last few months, and you continue to reiterate the importance of an all-of-the-above energy program. But I would kind of associate myself with the remarks of the Chairman. You know, an all-of-the-above means, you know, an all-of-the-above. And I think that the distribution that the Administration is making on research for all-of-the-above is a little bit convoluted when you think about the fact that 80 percent

of the world's energy will come from fossil fuels, at least through 2040, according to a recent EIA report. And I would refer back to the Chairman's chart there, it would look like to me if that is the future there, that the chart should be changed around where a majority of the money is going to for fossil fuel development because that is where the majority of the energy is going to come from.

With that being said, earlier this year I think the Administration announced it was going to conduct a quadrennial energy review to examine U.S. energy policy and make recommendations for the future with all of the other energy sources, all-of-the-above energy sources on the table. I think this is a good idea. In Texas we already understand the importance of all-of-the-above. As you know, Texas leads the Nation in oil and gas and wind energy production. What are your expectations for the QER and what do you expect to come out of that?

Secretary MONIZ. Thank you. The QER, the Q is of course quadrennial, but we are taking quadrennial kind of one year at a time. So this year the focus is specifically on energy infrastructure, the transmission, storage and distribution of energy. That is electricity. It is also fuels. So there is going to be two major focus areas. It will be around modernization of the grid taking into account all the threats that we see, extreme weather, cyber, physical threats, geomagnetic, infrastructure interdependencies. It will also look at fuels, infrastructure resilience with particularly focused on different regions because the regional challenges, the bottlenecks there are quite different. For example, we have seen in New England this winter the natural gas issues. We have seen in Upper Midwest and actually elsewhere as well, including going much further south, things like the propane issues which were big infrastructure issues. We have the oil by train issues. So this will be the focus this year. At the end of the year we intend to have this first chunk done that will then recommend whatever policy steps that we believe should be taken. And that will be—it is a public discussion, I should say, that is—tomorrow the first public meeting on the QER will be held here at the Capitol, in fact, and then we will be going out around the country.

Mr. NAUGEBAUER. Do you have an outline of the full scope of it? And obviously you were talking about specific areas here. And what I heard you saying is this is the first step. So is there—

Secretary MONIZ. Right.

Mr. NAUGEBAUER. —an overall model or outline of what you intend to review through this process?

Secretary MONIZ. So tomorrow there will be discussion about where we are going with this and the kinds of information we are bringing together. I might say that we have consolidated a number of policy activities in the Department, supportive of this QER, and built up analytical capacity because a lot of this is going to require some serious analysis. So we will discuss that, and this year's agenda is what I said. For the following years, we have ideas but to be perfectly honest, we are looking here at a long-range plan as a series of short-range plans. We are heavily focused on this infrastructure issue.

Mr. NAUGEBAUER. So obviously infrastructure is important, but what assurances can you give me that during this review that it will be an all-of-the-above approach?

Secretary MONIZ. Well, as I have said, the two major focal areas will be electricity with all forms of supply which the grid must deal with including, I could say in Texas, you know, long-range renewables with base-load plants. But like I said, the other major focus is going to be on the liquid fuels infrastructure with a regional focus.

Mr. NAUGEBAUER. I look forward to, you know, you giving us an update on the——

Secretary MONIZ. We would be happy to. Also, tomorrow there will be the public meeting, but we could provide, you know, some briefings if that is helpful.

Mr. ROHRBACHER. [Presiding] Thank you very much. And now Dr. Bera from California.

Mr. BERA. Great. Thank you, Mr. Chairman. And thank you for coming back to the Committee, Mr. Secretary. If I recall when you were last here, we talked a little bit about atmospheric carbon and the amount of time it takes to degrade atmospheric carbon. I am trying to search my memory. Did you say 4,000 years roughly?

Secretary MONIZ. No, but I said centuries.

Mr. BERA. Centuries.

Secretary MONIZ. Yeah.

Mr. BERA. Okay, but still a significant amount of time. Once the——

Secretary MONIZ. A long time.

Mr. BERA. —carbon is captured in the atmosphere, it certainly takes a long time to degrade it. We have also, you know, in much of the debate within this body as well as we talk about climate change, much of what we discuss is how to mitigate adding additional carbon to the atmosphere, and I think that is where some of the discussion has gone. In addition, when we talk about sequestration, much of what we are talking about is how we capture and do soil-based sequestration. That is accurate I believe as well.

Secretary MONIZ. Um-hum.

Mr. BERA. Within the DOE budget, though, are we also researching potential opportunities to do atmospheric degradation in terms of research and so forth? I would be curious about that.

Secretary MONIZ. Well, there are activities going on like beneficial use of CO₂. There are not that many opportunities at the scale that one needs. One example would be our sunlight-to-fuels hub which is an issue of using light, CO₂ and water to produce hydrocarbon fuels for use. That is one example. But I can't say that that is going to be commercial next year.

Mr. BERA. But some of the challenges that we potentially face is at some juncture atmosphere carbon that is already captured there is not going to degrade for centuries. We will have a challenge, and there probably is some irreversible point where——

Secretary MONIZ. Right, and in general—again, these are major scientific challenges, not easy, but a very important part of the portfolio because certainly if you compare that with some of the ideas about what is called often geoengineering, like putting sul-

fates into the atmosphere, those have consequences that I don't think we understand.

Mr. BERA. Absolutely. Switching over to kind of the scientific computing side and so forth, you know, Intel is a major presence in my district and has been obviously very involved in supercomputing. We have, within this body, talked about if some of the advanced scientific computing and challenges of managing big data as we accumulate more data, how we sort through that data, how we use it. You know, I am a physician by training. Certainly there are ways for us to use it to better manage patients and disease. I would like to have you comment on the DOE's, you know, supercomputing priorities here. You touched on the exascale program and so forth. I would love to hear your comments.

Secretary MONIZ. Thank you. Again, we consider this to be a very high priority and very much in line with the historic contributions that DOE has made in leading high-performance computing. So our plan would be to achieve exascale early, very early in the next decade. I want to make clear that we don't view this as a race to how many flops as opposed to generating the technologies. For example, energy management is a critical one if we are going to make the next stage. But resilience of computers, how do you do the algorithmic architectures, a whole set of questions that are very fundamental as we go to this next scale.

So we are going to push that and drive it through an application vision to science issues, to energy issues and of course, to national security issues. Our nuclear weapons program has always relied upon this very heavily.

Mr. BERA. Great. You also touched on the importance of the public-private partnership and your emphasis there and the Office of Technology Transfer. Just given your academic background, what are some things that we could do within this body to help facilitate that greater partnership between the private sector and academia, particularly our public universities?

Secretary MONIZ. With regard to the computing specifically?

Mr. BERA. Well, computing but also the whole area of technology transfer.

Secretary MONIZ. Okay. Well, I think the Committee could certainly advance these kinds of programs that are viewed in particular with having some degree of stability over time. That is very important I think for industry-making commitments, okay? Secondly, I think reinforcing, within balance, some of these group projects. Like in the Office of Science, I will mention the Energy Frontier Research Centers. I think this has been a terrific program. It is construct, is engaging the science community, getting 10, 12 people together on an important project over five years, and those, I know from my own experience, where MIT had, in my previous life, I want to make it clear, had two of those. They really attracted industrial partners in there.

So those are the kinds of things that I think, in terms of how it is structured, would be very helpful.

Mr. BERA. Great. Thank you. I will yield.

Mr. NAUGEBAUER. Thank you very much, Doctor, and just for the record, when I was asking my questions I mentioned that nuclear energy is inherently more dangerous. I meant of course light water

reactors are inherently more dangerous than the alternatives that we are now looking at.

Secretary MONIZ. That is how I interpreted it.

Mr. NAUGEBAUER. Good. Thank you very much. And now, Dr. Buschon?

Mr. BUSCHON. Thank you, and thank you, Mr. Secretary, for being here. In the wake of the EPA's new power plant emission proposals, there has been a lot of talk about CCS, but there are other clean-coal technologies that will be vital to our Nation's energy future. It seems like in our rush to CCS, it looks like we skipped over or ignored other potential technological breakthroughs. For example, one of the most interesting is the idea of supercritical CO₂ technologies where carbon dioxide is used as a working fluid to promote high thermal efficiencies. DOE is currently investing in these technologies for the use in both nuclear and renewable power applications. However, DOE is not exploring the use of the technology for coal applications. Can you discuss the application of supercritical technologies to increase efficiency and reduce emissions?

Secretary MONIZ. Actually, I really appreciate your raising that because that is another one of these cross-cutting examples that I mentioned earlier. We see this very much as applicable to coal as well. I know the specific coal budget request is small, but that is because we have—for various reasons, including recent history, nuclear energy is playing the lead role in that as we move to a demo. But we have a group which includes fossil and nuclear and renewables, especially because of the geothermal applications, and the demonstration project being done will be equally applicable to coal and to nuclear.

Mr. BUSCHON. Okay. That is good to know. And looking beyond power generation applications, are there other opportunities for coal-to-liquids R&D? What is the status of those type projects, trying to find alternative ways to use coal?

Secretary MONIZ. So we are evaluating—without saying too much, we are in due diligence right now in terms of a potentially large project involving coal-to-liquids and renewables. I can't guarantee that is going to come out the other end, but there is a due diligence going on right now on that.

Mr. BUSCHON. Okay. Thank you. I yield back, Mr. Chairman.

Mr. ROHRBACHER [PRESIDING]. Thank you very much. And I think we have now Ms. Edwards from Maryland.

Ms. EDWARDS. Thank you very much, and thank you, Mr. Secretary, for being here. I have a question actually about the authorization that is coming up for the Office of Science. We probably should be doing that in the next few months, and I think it presents quite an opportunity for us because there is a lot of support across the aisle for the activities that are carried out by the Office. But I do think that for some of my colleagues, one of the challenges is around the environmental research portfolio. So I wonder if you could describe in more detail how the Office of Science Environmental Research programs help to meet the missions of the Department of Energy, including the clean-up of legacy waste sites and provide a unique opportunity or contribution to the portfolio of environmental research carried out by other agencies and what those

relationships with the other agencies are and how they are coordinated with other relevant agencies and programs.

Secretary MONIZ. I will certainly respond to that, but maybe we can provide you as well a fuller response. That is a very expansive—

Ms. EDWARDS. Sure.

Secretary MONIZ. —question. So you are referring I think to the BER program specifically?

Ms. EDWARDS. Right.

Secretary MONIZ. And of course, we have a very, very strong biology-related program there as you know with a strong history for example in the human genome project in fact in getting that kicked off. So today we are not—first, let me make it very clear. We are not involved in the the human health questions directly as opposed to using advanced genomics and proteomics, et cetera, to address a set of energy-related and environmental-related clean-up questions.

I might add that there are some other discussions that have been initiated with us with NIH asking us about capabilities in our laboratories that might be useful for the brain initiative. So that is in the very early stages but could be something interesting. That is based mainly on our computational and sensor capacities.

Finally, of course, that program is the center for what is a major part of the climate change modeling program, a major engine for doing that and combining it with our large-scale computational capabilities, getting to finer and finer spatial resolution.

Ms. EDWARDS. What are the other agencies with which you work in the area of climate research?

Secretary MONIZ. There is a broad set of agencies. I probably can't name them all, but NOAA for example would be a very important one, National Science Foundation another one, I am guessing—

Ms. EDWARDS. What about NASA?

Secretary MONIZ. —the Interior.

Ms. EDWARDS. What about NASA?

Secretary MONIZ. NASA? Yes, absolutely. Thank you. Very important, NASA.

Ms. EDWARDS. Can you tell me more specifically about the work that you are doing around climate that relates to NASA and the importance of the connection between the two agencies?

Secretary MONIZ. Well, I think it is very complementary. I mean, NASA of course has the very strong observational capabilities, providing data, et cetera, and the Department of Energy I would say—you know, in the end our very major capacity is around high-performance computing and developing let us call it the software structures that one needs to analyze.

Ms. EDWARDS. Would you be comfortable with losing the responsibility for at least the climate part of the research portfolio because other agencies do similar things? Would it be okay to just deep-six the energy portfolio?

Secretary MONIZ. No. First of all, I think the Department of Energy has the greatest capacity in this area. It would be very hard to replace given again our high-performance computing capabilities. And secondly, it is so directly connected to the energy system.

So I think the Department remains the place where that can be most effectively carried out.

Ms. EDWARDS. Do you think—is there work that you are doing that you believe might be duplicative in other agencies? Have you found that in the relationship that you have, say, with NOAA, NASA, NSF?

Secretary MONIZ. So I think there has been now functioning for quite a long time the Interagency Climate Change Group that is specifically dedicated to having complementary programs executed but come together into a hole without gaps.

Ms. EDWARDS. So you don't think there is any duplication of effort in that area?

Secretary MONIZ. I would say nothing material.

Ms. EDWARDS. Okay. Thank you very much. Thank you, Mr. Chairman.

Mr. ROHRBACHER [PRESIDING]. Thank you. Mr. Posey?

Mr. POSEY. Thank you, Mr. Chairman, and thank you, Mr. Secretary, for your attendance today and more particularly for directly answering every question that was sent your way. We really appreciate that one. Can you give us a current status on the supply inventory and availability of plutonium 238 and any other nuclear fuel that may be needed for spaceflight?

Secretary MONIZ. Actually this is one where I am going to have to I think respond for the record, to be honest, I am not up to date on the plutonium 238 situation. I have to be honest about that.

Mr. POSEY. Okay.

Secretary MONIZ. But we will respond for the record—

Mr. POSEY. Within the next 10 days?

Secretary MONIZ. I am sorry. We will respond to you quickly. I am sorry.

Mr. POSEY. Okay.

Secretary MONIZ. Will to you directly, yes, sir.

Mr. POSEY. Well, the follow-up, you know, how much time does it take to produce the PU-238 and the costs associated with it?

Secretary MONIZ. Okay. We will respond on that as well. Obviously there have been issues historically of Russia being a principal supplier.

Mr. POSEY. You know, is a thorium reactor currently being employed or being considered as an alternative means to produce PU-238 from uranium 233?

Secretary MONIZ. No, sir. We certainly are not engaged in that, and we have no thorium program that I know of at least today.

Mr. POSEY. Okay. Thank you.

Secretary MONIZ. Yeah.

Mr. POSEY. Do you know of any other feasible, timely or cost-efficient alternative means of producing PU-238?

Secretary MONIZ. Again, I think we are going to have to give you a comprehensive response to all of these plutonium 238 questions, and we will do that promptly.

Mr. POSEY. Okay. Are you aware of any stockpile of U-233 in our national inventory that could be used to do PU-238 which is currently being considered for destruction?

Secretary MONIZ. Yes, well, we certainly have U-233 particularly at Oak Ridge. It is not in a form right now that I think is usable,

and in fact we are moving towards the disposal of a number of capsules that contain U-233.

Mr. POSEY. Could you expand upon that a little bit? Why we are disposing of it?

Secretary MONIZ. Well, it has been declared as a waste form. It has now been transferred to our environmental management program for disposal. We have not seen a use for it or projected use for it, particularly given the difficulties that would be entailed in terms of purifying it.

Mr. POSEY. Yeah, and of course, that was one of my previous questions. Processing 233 and the 238 and—I mean, I am kind of alarmed. I was hoping you were going to say no, there are none being considered. What we have, you know, we are guarding with our lives because it is so hard to produce, it is so hard to get and of course, it is hard to bring it to the next level as well. But I think this is real key to human or any space exploration and I would like to know as much about that as soon as possible—

Secretary MONIZ. Okay.

Mr. POSEY. —as you know about it or can find out about that.

Secretary MONIZ. Okay. No, I will get people on it today.

Mr. POSEY. Thank you very much.

Secretary MONIZ. Thank you.

Mr. POSEY. Mr. Chairman, I yield back.

Mr. ROHRBACHER [PRESIDING]. Mr. Peters?

Mr. PETERS. Thank you, Mr. Chairman. Thank you, Mr. Secretary, for being with us today. I had a question about algae. I understand that the Department of Energy, Office of Science has supported fundamental science research on biomass including \$600 million since 2007 for the three Bioenergy research centers which, according to the website, provide the fundamental science to underpin a cost-effective, advanced, cellulosic biofuels industry. We certainly support the work that is being done in that area and agree that that is important.

I would just encourage you to expand the Office's portfolio to include research on algae. I am sure that there are many Members of Congress, including of course other Members of the bipartisan Congressional Algae Caucus which I co-chair who would appreciate your support for algae research in the DOE's Office of Science, and I wondered if you had any thoughts on that.

Secretary MONIZ. Well, I will certainly get together with Pat Dehmer here and see what we are doing and what more might be done. I will note that there are other programs engaged here. For example, our work with DOD and USDA in our tri-agreement, I believe two of the four projects certainly involve oils in algae.

Mr. PETERS. Right, but I—

Secretary MONIZ. But I will check that.

Mr. PETERS. We certainly appreciate your participation in that and support that effort and the funding for it. And I also wanted to applaud the Department's attention to carbon capture utilization and storage research and wondered if you had any thoughts on what kind of technologies would be looked at for CO₂ utilization.

Secretary MONIZ. Well, today the principal utilization approach is enhanced oil recovery. In fact, we are producing about 300,000 barrels a day today from CO₂-enhanced oil recovery where that

CO₂ is mostly natural. So as that ramps up, there is a potential for about 600 megatons of CO₂ per year for enhanced oil recovery if the rather loose projections hold out, which can only come from carbon capture.

Mr. PETERS. Right.

Secretary MONIZ. So that is the principal one right now, just known—

Mr. PETERS. Just again, how much did you say?

Secretary MONIZ. The potential is for 600 megatons of CO₂ per year which would produce about 3 million barrels a day, and roughly speaking it is a half-a-ton of CO₂ per barrel of oil produced. So that could be substantial utilization. Then there are the others which are still in much earlier stages. I mentioned one earlier, sunlight-to-fuels, you know, sunlight plus CO₂ plus water going to fuels. That is an example of but much more research is obviously required.

Mr. PETERS. Right. Great. I appreciate that, and that is also very important. Finally, on advanced nuclear reactors, in Fiscal Year 2014, Congress gave the Department \$12 million for advanced reactor concepts for an industry-only competition, four times the amount you had in the previous year. And I hope that means that you could make some grants as high as \$4 or \$5 million that would attract competitors. Maybe the Department is looking into develop the whole reactor as opposed to individual technologies. Do you anticipate that the Department would be able to communicate with American companies along those lines?

Secretary MONIZ. I believe there is communication along those lines, but I will get back and talk with Mr. Lyons and see if we can't sharpen it up.

Mr. PETERS. Okay. Super. And again, Mr. Secretary, thank you very much—

Secretary MONIZ. Okay.

Mr. PETERS. —for your fine work and for being here today.

Secretary MONIZ. Thank you.

Mr. ROHRABACHER [PRESIDING]. Mr. Hultgren?

Mr. HULTGREN. Thank you, Chairman. Thank you, Secretary Moniz. I appreciate your very important work. I appreciate you being here as well. As all of us, I understand the tough constraints you are dealing with with the budget, so it is more important than ever that we understand the priorities the President is putting forward.

As you know, I have been fully supportive of basic scientific research and recognize that the Federal Government must do this. I also recognize our lab systems put us in a position to that while also making our user facilities available to other agencies, universities and even business. Many of these facilities run 24 hours a day and have to turn away researchers. This also ensures that we keep the brain power in America to make our next game-changing discovery right here and as soon as possible.

Would you say that the President prioritizes applied research, demonstration and deployment over basic research?

Secretary MONIZ. Yeah, well, I believe it is a very balanced view, and the President has stated many times that we understand that, yeah, our basic research enterprise ultimately is what underpins

all that we do. Then of course one has to make the difficult budget balancing.

Mr. HULTGREN. Yeah, it does come back to where priorities are. When I see a budget that has a less than one percent increase in the Office of Science, I can understand that certainly is a product of our budgetary constraints. But when you look throughout the rest of the DOE budget, it is easy to see that it is not the case. This is misplaced priorities according to my reading. Many programs for favored industries are getting a large budgetary increase. EERE received a 22 percent increase which includes funding for offshore wind demonstration, as the Chairman talked about.

When I think of technological development, I see basic scientific research as the horse that is pulling the cart. Whenever we have a budget that is putting strains on our ability to do this work while paying to rush out technologies which may or may not yet be viable on the open market, I am worried that we are putting the cart before the horse, and to make matters worse, we are starving the horse while we are at it. This will have long-term impacts on our ability to innovate and be a competitive Nation, I fear.

To better understand what the President is looking for so we can do this kind of work, can you broadly explain to us what you will need to see from the particle physics project prioritization panel, or P-5, report? I know we are still awaiting the report next month. So I am not asking you about any specific projects you might endorse. This is just so we have a better understanding of how the Administration goes about its prioritization process.

Secretary MONIZ. Yes. Thank you. I am looking forward very much to the P-5 report at the end of May and how HEPAP deals with it, High Energy Physics Advisory Panel. What I have said to the group last year and to Nigel, the director at Fermilab.

Mr. HULTGREN. Yes, doing a great job.

Secretary MONIZ. Terrific guy. To be honest—well, first of all, let me say the discovery science, particle physics, and others of the basic sciences, are very, very strongly committed to. The high-energy physics community, I have made no secret of it and they agree that for quite some time it has been very difficult to get a coherent kind of buy-in of the community, as least to some of the major commitments. I am very much hoping that that is what we will see in May, and with that, I think we can all do some work.

Mr. HULTGREN. I hope to, too. And I am optimistic from that. The P-5 report is vital for our direction in physics, and looked at it as similar to the decadal survey for NASA which our Committee has had hearings on.

What worries me about this budget is the mixed signals we are sending to the scientific community which is becoming increasingly international. This is just one example that is emblematic of the budget as a whole. The community understands their budgetary constraints, and they are trying to do this in a responsible fashion. But in the lowest budgetary scenario, they were told to expect flat line funding for three years as the President has used basic research as I see it as a piggy bank for other priorities. The HEP line was cut. While we continue to cite the need for community to rally behind a plan, how does the Administration justify the moves that are disincentivizing the community to do so? The international

community continuously says they just need to see some semblance of long-term stability. What are they supposed to think when the report comes out but we couldn't give the people crafting the report an honest budget scenario to work with? When we have projects engineering and design funding for project cuts, aren't we sending the wrong message? We have even cut accelerator R&D funding, even though it was vital for the LCLS upgrades DOE is citing as a major accomplishment. I just want to see a cohesive message that our science community can work with, that can have that confidence, that their work is important that we recognize and it is a priority. Again, I appreciate your work. I appreciate your openness, certainly to be here and to meet with me, to meet with others. I know these are challenging times, but I just want to express my concern and I think the concern that others around the world are feeling with the uncertainty there and specifically to our scientific community.

My time is expired. I yield back, Mr. Chairman.

Chairman SMITH. Thank you, Mr. Hultgren. Before I recognize the gentleman from California, Mr. Swalwell, I would like to recognize the Ranking Member, Ms. Johnson, for some comments.

Ms. JOHNSON OF TEXAS. Thank you very much, Mr. Chairman. I just wanted to announce the arrival of the new Member which we acknowledged earlier, Ms. Katherine Clark, from Massachusetts. Welcome

Ms. CLARK. Thank you.

Chairman SMITH. We do welcome the new Member. Thank you. Representative Clark, both the Ranking Member and I took your name in vain while you were at the earlier meeting, but we do look forward to your membership in this Committee and your participation and the interest and expertise you bring as well. Thank you.

The gentleman from California, Mr. Swalwell, is recognized for his questions.

Mr. SWALWELL. Thank you, Mr. Chairman, and welcome back, Secretary Moniz. I want to first thank you for taking a trip out to Livermore, California, and visiting Lawrence Livermore and Sandia National Laboratories. The employees there greatly appreciated it, and in this time of sequestration and especially after the government shut-down, it was a boost in morale to have our Secretary of Energy come visit the scientists who are working at those laboratories to keep us safe but also to move us forward in our energy security pursuits.

I want to also briefly mention the Neutralized Drift Compression Experiment II, or NDCX-II, which is a heavy ion fusion and basic science research tool. I am aware that earlier there were problems with standing up this project, but I am very pleased to hear that under a new management team at the Lawrence Berkeley lab and a peer-review path forward, that there is now potential to leverage the Federal investment already under way and for production of excellent science. And so I would like to commend the Department for working with NDCX-II to explore the benefits of furthering this operation.

But as far as the budgeting goes, I want to talk about NIF, the National Ignition Facility at Lawrence Livermore. And I was pleased to see NIF was spared from further drastic cuts, and I hope

you and the President will continue to provide adequate funding so that the groundbreaking science there can be achieved. And I wanted you to tell me your plans as to how the Office of Science can work more closely with NIF as we seek ignition.

Secretary MONIZ. Thank you. And by the way, let me just say the visit was terrific, and it is always fun to be at a lab, and the Livermore visit was great. I just want to note that it wasn't only me who went but my entire Secretary of Energy Advisory Board as well. And many of them had never seen NIF and were suitably impressed at its scale for sure.

NIF is doing some very important work. It is providing very important contributions to our stewardship program. And we are making sure that we preserve at least some degree of some of the basic science work at NIF as well as at our other high-energy density facilities which are really kind of a three-some. NIF is by far the biggest but the Z machine and the Omega machine as well.

In terms of the Office of Science, I think the first issue is, to be honest, until the ignition is achieved, then clearly the ideas of going into the fusion direction I think would be viewed as kind of premature. So I think that would be a very important milestone. As you know, progress towards that milestone is being made. Some substantial progress was made only in the last few months. We have to get there.

Mr. SWALWELL. And we look forward to having you out there when we reach ignition which we hope is soon——

Secretary MONIZ. That will be a good day.

Mr. SWALWELL. —rather than later. Also, I wanted to mention something that came to light yesterday, and I asked Members, Committee witnesses at the Homeland Security Committee hearing about this. We learned that just recently Al Qaida in their magazine, Inspire, used a picture of SFO airport and a message encouraging its members to detonate an explosive device. And it is not clear as to whether that was directed at SFO airport in the Bay Area or if it was just a general message. But it has raised concerns and reminds us that we remain under attack from Al Qaida, that they do seek to carry out a terrorist attack. And Lawrence Livermore and Sandia National Laboratories both do great work in protecting against the next attack. And I wanted to know how this budget will reflect our priorities of continuing to have our scientists not just do nuclear weapons stockpile stewardship but also work to prevent a terrorist attack and support law enforcement efforts.

Secretary MONIZ. Thank you. The nonproliferation budget, unfortunately, was reduced again within our constraints. Let me just stay without going into great detail that the stockpile stewardship plan that was submitted last year was budgetarily unrealistic, and we had to get that back under control while preserving our commitment to the stockpile basic plan, without going into detail, but what is relevant to this is that when we went through the process with the National Security Council and the Department of Defense, we came to a budget that we felt even though it reduced by over \$1 billion the life extension program in the Fiscal Year 2017, Fiscal Year 2020 period by stretching out some programs consistent with military requirements, we just needed that increase in the weapons program; and then with the constrained Fiscal Year 050 budget,

neither nonproliferation nor environmental management could come in at the same budget. Still a strong program, and the labs will be critical in securing nuclear materials—sources.

Secondly, we are—in fact, right now there is an Academy study and there is other work that we are doing looking at streamlining what is currently called—a word I dislike to be perfectly honest—Work for Others, because they aren't others. They are part of our team, like the Department of Homeland Security. And as you know, Livermore, in particular, is probably our lead lab for working on the Homeland Security issues.

So this is going to be a major focus, and again, we are balancing budget priorities within a fixed budget.

Mr. SWALWELL. Thank you, Mr. Secretary, and I yield back the balance of my time.

Chairman SMITH. Thank you, Mr. Swalwell. The gentleman from Arizona, Mr. Schweikert, is recognized.

Mr. SCHWEIKERT. Thank you, Mr. Chairman. Mr. Secretary, as you have heard all the Members speak, we all have sort of our individual areas of interest or expertise. So I don't mean this to be more of an ethereal conversation, more to educate me. When you have so many priorities coming at you and we come at you and say, all right, this is basic research, this is applied research, this is for commercialization. How do you arbitrage those differences but also how do you sort of walk through and make your decision making? You know, just as the conversation we were just having we are all incredibly hopeful one day we will hit that moment of ignition and control and, you know, the Holy Grail is there. But if you are not there, you don't prioritize hope, you prioritize data. Tell me your process. How do you go through that sort of triage?

Secretary MONIZ. I wish it were completely organized, but I will do my best. First of all, as we have discussed here and on the stockpile, et cetera, as you know the Department of Energy has a pretty diverse set of responsibilities. But what I want to emphasize is the common theme is, and I will be immodest for the Department in saying, the Department is a science and technology powerhouse, and that is its fundamental core capability, and those are the capacities that are being applied to energy, to basic science, to nuclear security.

Now, in each of those areas, and we did have our strategic plan put out last week, we try to keep focused on our major objectives. What is it that we have to accomplish in each of those major mission areas? We try to maintain a balance in terms of near, intermediate term and long-term focus. Generally speaking, the long-term focus when it comes to let us say, energy technologies, are probably more modest investments but very important to see something. An example I mentioned earlier is that we thought it was very important, even though it was only \$15 million, to emphasize in the fossil energy budget, ramping up a program on methane hydrates. That is the analogy of I think what the Department did in 1979 that led to unconventional gas today.

Mr. SCHWEIKERT. But what I am somewhat chasing is do you have a particular methodology? You know, do you sit down with a decision tree and say here is how we are going to do our priorities?

Secretary MONIZ. So the way it works is that the fundamental build-up, it starts bottom-up with our programs, and they will now essentially be starting the Fiscal Year 2016 bottom-up build-up. That is within guidance that we give in terms of general set of priorities. They come back with their programs. We kind of aggregate them at the undersecretary level. So in this case the energy and science programs come together. Frankly, to be technical about it, in that process, they are assigned budget targets, and the Office of the Secretary maintains a reserve, if you like, to——

Mr. SCHWEIKERT. Okay, so we——

Secretary MONIZ. —meet priorities.

Mr. SCHWEIKERT. Okay. So we have our budget priorities, and then our technology priorities as coupled with that, I am trying to systematize it in my head. And within that, do you rank saying, okay, this is basic research, this is applied? How does sort of the matrix work out?

Secretary MONIZ. We are—again, it is imperfect, but we are looking at making sure we have a reasonable balance which certainly, for science, includes recognizing the critical role that we have in underpinning especially the physical science establishment. So we have to look at our user facility, our big budget item. That is a responsibility to the entire science community. So that is a very high priority.

Mr. SCHWEIKERT. Now, how much flexibility do you actually have to pivot? And I don't know if this experience has actually happened where you have developed a line item, it is moving forward, and then all of a sudden in the literature, there is a private lab or some university lab that has actually leaped ahead of what you were going after, the ability to switch and move those resources somewhere else you consider either more promising or more worthy. Do you have that level of flexibility to make those decisions mid-stream?

Secretary MONIZ. Well, certainly over a period of a year or two. Now, in terms of a more rapid response, that depends in terms of how the appropriations language is written in the sense that, you know, obviously it directs us. But in the Office of Science I think there is a fair amount of flexibility in that regard, less so in some other parts of the Department.

Mr. SCHWEIKERT. And the last question. Mr. Chairman, forgive me. I know I am going a little long. Part of my reason for my curiosity of building sort of that decisions matrix is we know we often get tugged with the current popular discussion or the current technological folklore. And sometimes that is just noise in the decision-making process and was just curious how you screen that out.

Secretary MONIZ. First of all, let me say, I would be happy to find some time to sit down so that we might learn something also from your ideas in terms of how we can manage this kind of portfolio balancing. But let me just say that fundamentally, it is using our judgment on portfolio balancing in multiple dimensions.

Mr. SCHWEIKERT. Okay.

Secretary MONIZ. That is really the core principal.

Mr. SCHWEIKERT. But in many ways is done through judgment, not necessarily sort of a——

Secretary MONIZ. Yeah, there is no——

Mr. SCHWEIKERT. —hard—

Secretary MONIZ. —quantitative scoring.

Mr. SCHWEIKERT. Okay.

Secretary MONIZ. Right, and it is not just me. It involves a collective discussion. We have open discussions, and people—

Mr. SCHWEIKERT. Look, I know you have—

Chairman SMITH. The gentleman's time has expired.

Mr. SCHWEIKERT. Okay, sorry. Sorry, Mr. Chairman.

Chairman SMITH. Thank you, Mr. Schweikert.

Mr. SCHWEIKERT. Thank you for your patience.

Secretary MONIZ. But we can follow up if—

Chairman SMITH. The gentleman from Texas, Mr. Veasey, is recognized.

Mr. VEASEY. Thank you, Mr. Chairman. I wanted to ask you a couple of questions about the coal because I know that that is an area where there is some, you know, disagreement on. In your opinion, has coal gone through the problems that it is going through because of what is going on in the market or because of what is going on within the Agency as far as the policy direction in which the agency, you know, sees coal? Could you kind of touch on that a little bit?

Secretary MONIZ. Well, over these last several years, as we know there has been a substantial substitution of natural gas for coal, and I would say that was principally driven by the market in terms of the low gas prices. Going ahead, there will be issues, for example, of how the EPA rules turn out, let us say, for new coal plants where, as you know, partial CO₂ capture is in the proposed rule.

Mr. VEASEY. Also, another coal question. I have heard that some people say we have as high as a 200-year supply of coal just in our country. Can coal be made clean enough to where it is a cleaner-burning fuel like the other things that we are looking at as far as renewables, natural gas, et cetera?

Secretary MONIZ. Well, of course, first of all, in terms of conventional pollutants, we have done a lot to clean that up as you know over the last decades. The challenge now is carbon dioxide, and there we have our eight major demonstration projects right now to pursue that. I personally believe there is nothing in the science that suggests that CCS or CCUS will not work at substantial scale, and then this question of what are we going to do in terms of CO₂ policy because clearly for a coal plant, it is not going to be less expensive to capture than not capture, but the question is, in the competition, we expect coal to have a marketplace role in a low-carbon environment through the successful higher efficiency of coal plants and CCUS.

Mr. VEASEY. If I could very quickly switch over to methane and, you know, as it pertains to natural gas in particular, you know, there has been some concern about, you know, the release of methane, you know, at the wells. What do you think can be done more to help ease that? Because obviously that everyone says that the natural gas is a much more cleaner-burning fuel. But with the methane being released, obviously that can create problems. And if you can capture the methane and stop it from releasing, obviously it would make it even more clean and more efficient. So can you just talk on that a little bit?

Secretary MONIZ. Sure. There is by the way an interagency methane group that is working, DOE, EPA, Department of Interior, USDA. There has been a lot of progress in most places in capturing methane from production because of course it is a valuable product, and in some cases it is also driving the replacement of large diesels to drive the hydraulic fracturing by natural gas engines which, again, are much cleaner, and so it helps the air quality in the production zones.

We have a challenge in many places on the production side, like in the Bakken shale where the infrastructure fundamentally isn't there to move the gas out and so they are flaring a lot of it. But the state has made a strong commitment to lower that.

But what I want to emphasize, and frankly it is a strong focus of the Department of Energy, is that—and more data are needed. But the methane issue has probably been overly focused on the production well as opposed to the end-to-end system. So the whole issue of the gathering, the transportation and the distribution systems for natural gas is an issue.

We hosted a multi-stakeholder workshop, the first of five that we will have, on methane emissions recently involving industry, labor, environmental groups, et cetera. And it was very interesting. There was a lot of convergence there, and it is clear. One of the big challenges is, and it is not only for methane, is that we have a very old natural gas distribution infrastructure, for example, in many of our cities. We saw a tragedy in New York not so long ago. And I think the issue is jobs as well. Let us get a modern infrastructure built, and that will take care of the methane leaks as well.

So those are some of the ways we are thinking about it.

Mr. VEASEY. Okay. Thank you, Mr. Chairman.

Chairman SMITH. Thank you, Mr. Veasey. The gentleman from North Dakota, Mr. Cramer, is recognized.

Mr. CRAMER. Thank you, Mr. Chairman, and thank you, Mr. Secretary. I am delighted to hear of your continuing commitment to putting research dollars into carbon capture, especially into using that carbon to enhanced oil recovery because, of course, in North Dakota, any research that has as its ultimate goal extending the life of our coal mines and our Bakken oil patch is a noble goal indeed. So I thank you for that.

I just hope that we can put enough research dollars into DOE to keep up with the rules at the EPA so we don't get the rule ahead of the research.

I want to ask you specifically, though, you referenced earlier a little bit about efficiency, and I want to focus specifically on turbine efficiency and the role that might have in producing, well, putting us at a global advantage for lots of things, not the least of which is by the way the manufacturing sector and manufacturing the turbines that might can get us another percent or two or three. And with gas becoming more and more important and a more and more important fuel, for generating electricity, I would like you to speak specifically if you would to research that enhances gas efficiency for generating electricity.

Secretary MONIZ. Certainly. And by the way, I might add, going back to your prologue, of course, with the Great Plains Plant—

Mr. CRAMER. Yes.

Secretary MONIZ. —I think they have now passed 20 megatons of CO₂ for enhanced oil recovery in the Weyburn field. So it is quite a—

Mr. CRAMER. That is true.

Secretary MONIZ. Quite a large amount over the last ten years or so. On turbine efficiency, the Department really going back to the '90s had a very, very major program on increased Turbine efficiency that was done with—I think the main programs were with GE and with Siemens leading both of them to now commercialize. I think it is called the F-turbine series. So those were a substantial job in efficiency. I think they are now getting into the marketplace, and it is very impressive, certainly in combined cycle plants. Now I think you are talking over 60 percent efficiency. So it is a big deal.

Mr. CRAMER. Well, if we could squeeze another percent or two and get into the low 60s, I think it, my understanding is that it could make quite a massive difference.

Secretary MONIZ. Yeah, no, percent's here or there matter.

Mr. CRAMER. Yeah, they sure do. I want to focus on something a little different now. A couple of years ago, I think two years ago this month actually, the Administration or the President actually signed an executive order forming the Interagency Working Group on research for hydraulic fracturing, and at the time it was announced that there would be a research plan developed by the agencies included, of course the Department of Energy, EPA, I believe the Geological Surveys, part of that. It was going to be presented to Congress in January. January came and went last year. January has come and gone this year. We are now into the blossom season here in Washington, D.C. I am just wondering if you could give us some idea of when we will see that plan?

Secretary MONIZ. Okay. I will certainly look into that right after the hearing. There is a very active group with DOE involved in these unconventional gas technologies. I certainly have seen a research agenda there, so let me just look into that and see if we can't get something to you.

Mr. CRAMER. Well, I know. I think the promise was that Congress would be presented with a research plan from the working group. We have not seen that.

Secretary MONIZ. I hear you.

Mr. CRAMER. So we—

Secretary MONIZ. So let me look into that.

Mr. CRAMER. Okay. We will look forward to—

Secretary MONIZ. Because there certainly is an R&D agenda that I have seen there.

Mr. CRAMER. Well, I appreciate that. And Mr. Chairman, I yield back the balance of my time. Thank you.

Chairman SMITH. Okay. Thank you, Mr. Cramer. The gentleman from Massachusetts, Mr. Kennedy, is recognized for any questions except those dealing with offshore wind.

Mr. KENNEDY. Thank you, Mr. Chairman. I appreciate the time. Mr. Secretary, it is great to see you again. It is always good to see a constituent. So thank you for your service.

I want to follow up a little bit about some of those issues that we have talked about before but predominantly clean energy and—

we will leave it broad for that. But nevertheless, the Department of Energy's budget proposal, Mr. Secretary, as you know, continues to support an all-of-the-above energy strategy, and you spoke about this a little bit a couple minutes ago. Specifically, it also increases funding for clean and renewable energy programs. The clean energy sector has huge implications in both short and long run.

In the long run, I think we could make huge strides in protecting our environment and minimizing the negative impact of human interaction with our environment. If these renewable technologies are brought to scale, it could also significantly address an issue that we constantly hear from our constituents back home about ever increasing energy prices.

I would like to focus however, briefly, if I could with you, Mr. Secretary, on the shorter term economic implications of investing in clean energy technologies. As you well know, my district and yours is home to a number of communities that are already taking on some of these risks. A recent report from the Massachusetts Clean Energy Center notes that Southeastern Massachusetts and your hometown of Fall River is right at the center of it, it is now one of the fastest-growing regions in the Commonwealth with clean energy employment, with an increase of 14.3 percent from 2012 to 2013 representing over 17,000 jobs. That is a real impact right now.

With this budget, the Administration is recognizing this opportunity. So in that framework, I have got three questions for you, sir. First, what can we expect from the Department of Energy's efforts to invest in these types of technologies? Second, what results should we realistically be able to achieve if we funded this proposal in full. And third, how can we prepare to develop a top-notch clean energy workforce to help keep these jobs right here at home? Thank you.

Secretary MONIZ. Thank you. Let me try to take those three on. Well, I will kind of all put them all together I guess. So first of all, the issue of the jobs, in the energy sector in general and in the clean energy sector in particular, clearly are increasing. I think for example in solar energy where up to like 150,000 there, and that is just only one sector. In wind, by the way, where you can make the translation of jobs based on growth we have gone in a relatively short time from the United States providing about 25 percent of the supply chain for wind turbines deployed in the United States to now over 70 percent. So that is, again—manufacturing, installation, all these kinds of jobs are happening. So the programs themselves will continue to stimulate jobs and to stimulate manufacturing.

Now, in that context, another element is our focus in laying the foundation for the critical technologies for our future manufacturing capabilities in clean energy and other things. So for example, the Department of Energy and DOD did the first manufacturing institute on 3-D printing. The Department of Energy did another one ourselves on high-powered electronics, which affects many parts of the energy technology space. We have announced a third one on light-weight composite materials. Many applications, vehicles, wind turbine blades, et cetera. So that is a second.

A third element is in our budget proposal, we want to start something I mentioned it a little bit earlier, NIH-type traineeships. This is going to the human resources now, traineeships that focus on specific areas of human resource need in this country, like power electronics, like people who really know high-performance computing, algorithm development, areas like that. So targeted sectors where we need more of our people engaged.

Mr. KENNEDY. Thank you, Mr. Secretary, and I appreciate your plug for, which I am not sure if you knew, our manufacturing bill that we had a hearing on here in this Committee. It has got great bipartisan support with Congressman Tom Reed as well a number of bipartisan co-sponsors, up to about 60 or so. So hopefully some of our other colleagues will sign on. Thank you for your time, sir. Mr. Chairman, I yield back.

Chairman SMITH. Thank you, Mr. Kennedy. The gentleman from Texas, Mr. Weber, is recognized for his questions.

Mr. WEBER. Thank you, Mr. Chairman, and Dr. Moniz, thank you for being here. Do you know where the largest CCSS facility is in the country?

Secretary MONIZ. In this country, it is probably in Texas, and certainly the largest CO₂ EOR place in the country is in West Texas, I think.

Mr. WEBER. Right, but for the carbon capture and sequestration storage, or what you would call carbon capture and utilization storage facility, do you know where the largest one is?

Secretary MONIZ. Right now it is right in the Houston Channel, I believe.

Mr. WEBER. Well, no, it is actually in my district.

Secretary MONIZ. Oh, I am sorry. Wrong district.

Mr. WEBER. I know that is a shocker for you. Yeah, just east of that small town of Houston which is one of our suburbs——

Secretary MONIZ. Okay.

Mr. WEBER. —over in the Beaumont, Port Arthur area.

Secretary MONIZ. That is what I meant, Port Arthur.

Mr. WEBER. I knew that. You just spelled it differently.

Secretary MONIZ. That is right.

Mr. WEBER. So do you have any idea what the cost of that facility was?

Secretary MONIZ. No, I do not, sir.

Mr. WEBER. It was about \$440 or \$460 million as I recall, in the mid-400s. Do you know what the Department of Energy's kick in to that was, how much money they supplied to Air Products, Incorporated?

Secretary MONIZ. Not precisely.

Mr. WEBER. Sixty percent, about 200. If you just took \$400 million, it would be \$240 million. It is going to be a little bit more than that. I don't believe that that kind of project is duplicable. You can't duplicate that. You know, we had the chairman from Southern Energy come in and talk about the plant they are building in Mississippi, and there is no way that we can, as rational people say, that that is a sustainable economic business, viable business project when the taxpayers are having to support it to the tune of 60 percent. Would you agree with that?

Secretary MONIZ. Well, I think we need the context, however, that these are first mover plants, and the expectation is costs will come down as more of these——

Mr. WEBER. Do you know how long it has been in operation?

Secretary MONIZ. I thought it was like one year.

Mr. WEBER. It has been a little over a year they opened up. I was there for the grand opening.

Secretary MONIZ. Yeah.

Mr. WEBER. But when you have got other plants looking at this and saying there is no way, trust me, they are studying that bottom line, and that is cost in that balance sheet. And they are saying there is no way they can duplicate this. I just want to make sure you know. I believe that the United States is poised on the verge of an energy renaissance, but I also believe that the current energy policy, and that is the Department of Energy, their current policy is going to keep us from being able to realize as much of that energy renaissance as we might have and could ultimately affect national security.

So here is my question for you. Have you read the State Department's study on the Keystone pipeline, the report?

Secretary MONIZ. I have not read the full report. I read the summary——

Mr. WEBER. You read the summary——

Secretary MONIZ. —of the EIS.

Mr. WEBER. —of it? Are you aware that some seven Federal agencies, U.S. Army Corps of Engineers, Department of Ag, Department of Energy, Department of Interior, Transportation, Office of Pipeline and Safety, the U.S. EPA and various state and local agencies contributed to that report? Did you know that?

Secretary MONIZ. Yes.

Mr. WEBER. Including of course the Department of Energy?

Secretary MONIZ. Yes.

Mr. WEBER. Do you agree with the findings of that report?

Secretary MONIZ. Well, we are in the process right now of making our comments in the 90-day comment period. So I think I have to leave it at that for the moment.

Mr. WEBER. But you were a part of that report. So when——

Secretary MONIZ. Our office supplied technical support.

Mr. WEBER. Okay. Did you do a good job?

Secretary MONIZ. I think so.

Mr. WEBER. Okay. Well, then that report should be a good report.

Secretary MONIZ. For at least our part of it.

Mr. WEBER. Okay. All right. Touche. So does the Department of Energy ever give thought or study to the greenery, the environment, the trees, the grass on their ability to take CO₂ and to use it in photosynthesis and ingest, you know, how they use CO₂, Plants take that and make oxygen. Are you studying the ability of the environment going forward to be able to synthesize if you will that CO₂ or are you just studying the output of the CO₂ from the various sources?

Secretary MONIZ. No, no, there are a variety of efforts in terms of understanding and maybe engineering some of the up-take in land use systems.

Mr. WEBER. Okay. Do you agree with my idea, my statement, that our energy policy may be hampering that energy renaissance and that could affect our national security?

Secretary MONIZ. No, I do not, sir.

Mr. WEBER. You don't agree?

Secretary MONIZ. No.

Mr. WEBER. The President said during his——

Secretary MONIZ. I would argue by observation we are doing pretty well on the renaissance.

Mr. WEBER. Well, I think we could do better. We would love to get the Keystone Pipeline down into my district. And so when the President said under his energy policy, electricity prices would of necessity skyrocket, have you seen that video, that YouTube?

Secretary MONIZ. No, I have not.

Mr. WEBER. I think he is making good on that claim, but I think it is at our expense.

Secretary MONIZ. Well, of course, our job as we have always said is fundamentally—the aim of our innovation programs is continued cost-reduction of technologies, especially low-carbon technologies.

Mr. WEBER. Okay. Mr. Chairman——

Secretary MONIZ. Which would include CCS and others.

Mr. WEBER. Yeah, it is just not duplicable. Mr. Chairman, I yield back.

Chairman SMITH. Thank you, Mr. Weber. Let me say to Members that we are going to recess after Ms. Brownley asks her questions and Chris Collins asks his questions, and we will recess until noon, and we expect the votes to be over. Secretary Moniz can stay until 12:30. So between 12:00 and 12:30 I believe Members who have not asked questions will have an opportunity to do so, and we will be able to accommodate all Members.

The gentlewoman from California, Ms. Brownley, is recognized for her questions.

Ms. BROWNLEY. Thank you, Mr. Chairman, and thank you, Mr. Secretary, for joining us today. My questions concern the Environmental Management account and the ongoing clean-up of Area 5 of the Santa Susana Field Lab which is in my district. Clean-up at Santa Susana is of critical importance to my constituents and has been for decades. It is undisputed that toxic chemicals were used, spilled and dumped at Santa Susana. It is imperative that we eliminate the potential and significant health and safety risk for people who will continue to live nearby and those who will be using the site in future years.

Any clean-up to less than background levels will leave both radioactive and chemical contamination in place regardless of the end-use of the property which, at this point, is undecided.

So my question is, is the Department of Energy fully committed to adhering to the 2007 Consent Order for Corrective action and the 2010 Administrative Order on Consent with the State of California?

Secretary MONIZ. Yes. My understanding is that we are developing the required EIS, it is moving along and expect to have that available, that draft, late this year or very early in 2015.

Ms. BROWNLEY. So you are on track for early '15? I think it was supposed to be completed——

Secretary MONIZ. Correct.

Ms. BROWNLEY. —by September?

Secretary MONIZ. Yeah. Well, maybe late this year. We are trying.

Ms. BROWNLEY. Okay. But by 2015 you believe——

Secretary MONIZ. Early.

Ms. BROWNLEY. Early.

Secretary MONIZ. Early 2015, preferably late this year.

Ms. BROWNLEY. Thank you, sir. And in the 2014—well, in 2014 Congress provided approximately \$9.4 million for the clean-up and in the 2015 request asked for only \$8.96 million which is a reduction of about almost \$450,000. So my question is, has the Department of Energy requested reduced funding?

Secretary MONIZ. Well, yes, obviously we proposed a few percent reduction. I mean, this is consistent with what we had to across the board because of the constrained caps. I mean, in our overall EM budget, we had to come down \$200 million. But within this budget, we will complete the draft EIS. We will start the final EIS. We will submit the conceptual ground water model report. I think we can accomplish a lot in Fiscal Year 2015.

Ms. BROWNLEY. Okay. And so there is a list of milestones proposed for 2015. You have mentioned some of them, the draft EIS, completing ground water characterization, submitting a final remediation plan and a conceptual ground water report to state regulators. So you feel the budget is sufficient to accomplish those goals?

Secretary MONIZ. I think we can. It is always tight, and a little more money would help. But again, this is just in the context of—this is frankly like an across-the-board haircut that we had to take in the end.

Ms. BROWNLEY. Understood, and I appreciate your answers and appreciate your commitment to this. This is an issue that I have worked on for a very long time when I was in the State Legislature and now here in Congress, and I can't underscore how important it is to Southern California and particularly to my constituents. So I appreciate your focus and commitment.

Secretary MONIZ. Thank you.

Ms. BROWNLEY. Thank you. I yield back, Mr. Chairman.

Mr. COLLINS. Thank you. I will be the last one, Mr. Secretary. Then we will go through the recess. My question concerns the loan guarantee program and in particular, you know, I live in a world where actions speak a lot louder than words. And we have loan guarantees for renewables. We have loan guarantees for fossil fuel programs. Frankly, some of the actions that we have seen including what I will call the gross negligence on the due diligence on Solyndra. I have spent 30 years in the private equity world. I know due diligence, and I have to say, on that one, and I don't want to beat a dead horse, it was pretty obvious that the Administration was looking to approve something frankly absence due diligence.

But right now my concern is the \$8 billion fossil loan guarantee program which closed on February 28. And we saw some of those projects appear to be ones that were submitted in the past. They languished. They were anything but fast-tracked. Actions seem to indicate to many of us the Administration is picking winners and

losers. They are picking renewables over fossil. They are fast-tracking, absent due diligence, on renewables while good fossil programs languish. That is what our observations based on results would indicate.

So frankly, with the February 28 date, have any of these fossil grants been approved?

Secretary MONIZ. Well, no. But first of all, I want to emphasize that the program is not closed. This is kind of a rolling set of applications, though.

Mr. COLLINS. So we had the ones that——

Secretary MONIZ. So that was the first——

Mr. COLLINS. —were due——

Secretary MONIZ. Yeah.

Mr. COLLINS. —February 28.

Secretary MONIZ. That was the first date.

Mr. COLLINS. Yes.

Secretary MONIZ. And there will be other dates moving forward. Secondly, there are some earlier applications. One in particular was mentioned earlier, coal to liquids, which was dramatically changed by the proposers, and they have been notified that that is going into—well, they were offered to go into the next stage of due diligence, and they have accepted, and so that is now into due diligence. And there were some new proposals that came in as well that I can't discuss at the moment.

I must say, obviously I have been at the Department for, I don't know now, 11 months I guess, counting on 11 months. And the current director of the Loan Program Office, Peter Davidson. I would love to get you two together to discuss the program if that is of interest and given your background. But I think he is very competent, and I have to say, I believe that this group is very competent in their due diligence, and I think we could demonstrate that.

Mr. COLLINS. Well, can we expect to see a number of programs on the fossil program that were completed in February, approved in a rolling method?

Secretary MONIZ. Well, that is our intent.

Mr. COLLINS. Okay.

Secretary MONIZ. But again, we will not approve projects just to hit \$8 billion. We will only approve projects if——

Mr. COLLINS. Okay. No, I understand——

Secretary MONIZ. —if they do not do due diligence.

Mr. COLLINS. —but again, the past would indicate in renewables, in fact, the Department prior to your heading it did approve projects for the purpose of approving projects absent due diligence——

Secretary MONIZ. Well, but he——

Mr. COLLINS. —or Solyndra never would have occurred so——

Secretary MONIZ. Well, sir, again, without getting into Solyndra specifically, I can say that a lot of other renewables projects have been very, very successful. One example we like to quote is in 2009, 2010, as you well know, when debt financing was particularly difficult, the first five utility-scale photovoltaic projects were given loan guarantees. They are all performing, they all have PPAs——

Mr. COLLINS. Well, again, no I understand that——

Secretary MONIZ. And——

Mr. COLLINS. —and time is running short.

Secretary MONIZ. Oh.

Mr. COLLINS. But let me ask you, have you done an after-action look at Solyndra, what went wrong, what didn't happen, what should have happened. Have we learned from our mistakes?

Secretary MONIZ. I have not personally done that, but I believe that was done before my arrival and Solyndra was good——

Mr. COLLINS. Well, I——

Secretary MONIZ. —very early in the program.

Mr. COLLINS. I would appreciate if you could share with our Committee what that after-action found because the staggering amount and the fact that, quite frankly, it has become, you know, the stalking horse that we talk about. It would make I know me and others feel good if we would learn from the mistakes. That was a very costly waste of taxpayer dollars. Let us hope we get some value out of it to learn from.

Secretary MONIZ. Yeah, if I may just add that it is because I don't want to tie it to the one particular project, but I think the learning process in this group has been very, very clear and very, very substantial. I think they are an extremely strong group in this moment, and that came from lessons learned.

Mr. COLLINS. All right. Well, I would like to see what we did. As I close up for right now before we recess, can you tell us the dollar amount of loan guarantees that have closed for renewables? The total.

Secretary MONIZ. The total amount.

Mr. COLLINS. Yeah, the total dollar amount for renewables versus nuclear versus fossil, closed.

Secretary MONIZ. Well, what closed is \$6.5 million on nuclear.

Mr. COLLINS. Okay.

Secretary MONIZ. Roughly \$8-plus billion on advanced vehicles. So that is say, \$14, \$15 billion. Subtract that from 32. So we are at 14 probably renewables.

Mr. COLLINS. And none for fossil?

Secretary MONIZ. Not yet. I don't believe any have closed on fossil yet, but that is the current call.

Mr. COLLINS. Okay. Thank you. Thank you very much.

Secretary MONIZ. Yeah.

Mr. COLLINS. The Committee will now stand in recess until after the beginning of the last vote. Thank you for all your patience.

Secretary MONIZ. Thank you.

[Recess.]

Chairman SMITH. The Science, Space, and Technology Committee will reconvene. Secretary Moniz, several Members have come back from our series of votes, and I am glad they are here. And then I have an additional question for you about nuclear fusion after they have finished.

And we will now turn to the gentlewoman from Massachusetts, Ms. Clark, for her questions.

Ms. CLARK. Thank you, Mr. Chairman, and thank you for the very gracious and warm welcome to this Committee. It is truly a privilege to be a part of it, and I thank you for that and also for

having arranged at my first hearing we will have one of our most prestigious Bay Staters here with us.

Chairman SMITH. It was all intentional.

Ms. CLARK. Yes. Well, thank you. It is fantastic.

Secretary MONIZ. And a Red Sox fan.

Ms. CLARK. That is exactly right. And so thank you very much, Mr. Secretary. It is a pleasure to be here with you. And I had a couple of more general questions as I make my way around my incredible district and the work that is being done on energy, the life sciences and really that connection in Massachusetts between the academics and what we produce, what we research in the labs and our ability to take that to the marketplace.

One of my questions for you comes out of what I am hearing has certainly been a focus of my colleague, Congressman Kennedy, and many others on this Committee is a focus on STEM education. And I was very heartened in your testimony when you mentioned your commitment really to keeping the United States as a global leader in high-performance computing. And some of these STEM programs that have been very vital to the work in Massachusetts, there have been many, but two in particular are the Computational Science Graduate Fellowships and also the graduate student research programs, both of which the budget is proposing to significantly cut. And I wondered if you could tell me a little bit about your thinking behind that and what some of the alternatives for those programs might be.

Secretary MONIZ. Thank you, and my I welcome you as well to Washington. First of all, in terms of graduate student support through research programs, that will continue in a very robust way that, you know, principally going through our research grants. On the fellowship side, again, the Administration has felt that it would be more efficient and effective to consolidate how fellowships are done which, for example, in our case the National Science Foundation being in the lead and that we will collaborate with them so that our areas of interest are addressed. But in that particular case, the computational science as I have said, that is one of the areas that we would like to use in this kind of pioneering effort this year, I mean Fiscal Year 2015, for the NIH-style traineeship programs which will focus on specific areas of national need of relevance to energy programs.

So we will emphasize that, and if I may make one other comment more broadly on the STEM education, that is we two years ago started a Women in Clean Energy program. In my previous life at MIT, we were pleased to help that program go forward with a partnership, and then subsequent to my arrival last year, we started a similar Minorities in Energy program. And so another very important issue is that frankly, both women and minorities are underrepresented in the energy workforce today. It is opportunity for them, and it is need for us.

Ms. CLARK. Great. Thank you. You anticipated my second question. That is wonderful, and I see that my time is dwindling here, but I just want to also say that as we look at our clean tech and really look at that thriving industry in Massachusetts, there are some that say it is too soon, it is too immature of an energy to really have an energy technology to really have an impact on climate

change and on reducing greenhouse emissions. And I certainly look forward to working with you to disproving that.

Secretary MONIZ. And we can't wait.

Ms. CLARK. Thank you very much.

Secretary MONIZ. Thank you.

Chairman SMITH. Thank you, Ms. Clark. The gentleman from Ohio, Mr. Johnson, is recognized for his questions.

Mr. JOHNSON OF OHIO. Thank you, Mr. Chairman, and again it is great to be serving on the Science and Technology Committee, and I would like to also welcome our colleague, Ms. Clark, to the Committee as one of the newest Members myself. It is good to have her aboard.

Mr. Secretary, it is always good to see you.

Secretary MONIZ. Good to see you.

Mr. JOHNSON OF OHIO. There might be those that think you and I have a standing Thursday morning meeting because we have been meeting like this for a couple of weeks now. And I would like to start off today with a few questions on Yucca Mountain, Mr. Secretary. Your Department has repeatedly committed, both in Congressional hearings and in correspondence, that DOE would honor NRC's November 18th order and support the Yucca Mountain License Review. As recently as January 6, the DOE stated it would honor NRC's request to complete a ground water supplement to the Yucca Mountain EIS and indicated that it had taken steps to do so, including procuring contractor services and drafting a Notice of Intent.

However, on February 28th, DOE notified NRC that it would not prepare the EIS supplement. Why did DOE change its mind over those seven weeks?

Secretary MONIZ. First of all, we are fully supporting the process, and what I had referred to in terms of contractor, et cetera, we are working very hard on the update of the ground water technical volume which is the essential input, and frankly, we think we are probably going to get that done this month, so pretty quickly. In the discussions in terms of actually running the process, we had discussions with Chairwoman McFarland. The view was—and in their request, it was made clear that that step could be done by either one of us, that as the adjudicator, then we felt it was better if they formally ran the process, but we fully support all of the information required. In fact, we were in the public hearing on Monday presenting the ground water technical process.

Mr. JOHNSON OF OHIO. Well, the NRC currently has a remaining nuclear waste fund balance of some \$12.4 million, and it is not clear that NRC has enough funds to complete the EIS supplement and to complete the remaining safety evaluation report volumes. Won't your decision, the Department's decision force NRC to deplete its funds even faster?

Secretary MONIZ. We don't believe it is a material impact. I mean, what we are doing right now with the ground water technical analysis has required some funding which we have, and those remaining steps are not resource-intensive. But certainly we had no statement that that would create a problem.

Mr. JOHNSON OF OHIO. Well, I am just curious. If there was a question about who was responsible for doing the EIS, why did the

DOE commit to doing it in the first place if now you are determining that it is best carried out by NRC?

Secretary MONIZ. Well, Pete Lyons wrote a letter as you said correctly in January stating that he would. Again, we had further discussions including my discussing with the chair of the NRC, and we just felt this was, in the end, this was a better approach.

Mr. JOHNSON OF OHIO. Well, given that DOE has a nuclear waste fund balance of about \$44 million, wouldn't it be more cost effective for DOE to carry out that earlier commitment?

Secretary MONIZ. I have to check the exact numbers. I think our unobligated balances are something like \$17 million I believe.

Mr. JOHNSON OF OHIO. My understanding is \$44 million, but I mean, if you could get back to me on that, that would be great.

Secretary MONIZ. Well, I think the distinction is that the unobligated balances—I will get back to you precisely, but I believe it is \$17 million. I believe the thought is that if called upon, we may be able to deobligate some other funds and bring them into this.

Mr. JOHNSON OF OHIO. All right. Well, Mr. Secretary, I enjoy working with you, and I like you. We have a good rapport, and I think that you are doing the best that you can in a tough situation. But from where we are sitting, it seems that there is an orchestrated campaign by Senator Reid and the Administration to run the funding dry at NRC so that they cannot complete the safety evaluation report. This I happening because once that safety evaluation report comes out saying that Yucca is safe for a million years, then opposition from Senator Reid will be made moot, and there will be no choice but to move forward with Yucca. Are we wrong in this assumption that there is pressure coming from the Senate Majority Leader?

Secretary MONIZ. I can flatly state that there was no consideration of that type in that decision about their completing that, because again, we are doing the lift in terms of the update of all the technical information.

Mr. JOHNSON OF OHIO. Okay. And my time has expired, and again, this is not personal because I enjoy working with you, Mr. Secretary. But we want to make sure that you and the NRC know that we are very carefully watching this process, and we are not going to allow any kind of outside influences to detract and delay the release of that safety evaluation report.

Secretary MONIZ. And if I may just again, we will, as we have said, we will execute the things that we need to do. The courts have ruled against the NRC in that case. But also I will just note that, as you all know, another court ruling which we have pursued is we submitted our letter on the waste fee following the court's dictate.

Mr. JOHNSON OF OHIO. Okay. Well, thank you, Mr. Secretary. Mr. Chairman, I yield back.

Chairman SMITH. Okay. Thank you, Mr. Johnson. Secretary Moniz, I was going to ask you a question about nuclear fusion, and I know you have an expert with you, the Acting Director of the Office of Science, but before she steps up, I now realize it would amount to probably an individual tutorial. And what I would like to do in lieu of getting into that right now is ask you if you would submit a report and give us an update on the progress we are mak-

ing toward achieving nuclear fusion, and let me distribute it to all Committee Members. And that way everyone will benefit from your knowledge, and it just won't be an individual right now.

So if we could do that, then we will momentarily stand adjourned. But thank you, Secretary Moniz, for being with us today. Thank you for being gracious with your time. And I have to say to you, you always give the impression, which I assume is an accurate one, of being forthright and basing your decisions more on data than something that might be influenced by politics. And we appreciate that.

Secretary MONIZ. We try.

Chairman SMITH. Thank you, Secretary Moniz.

Secretary MONIZ. Thank you, Mr. Chairman.

Chairman SMITH. And we stand adjourned.

[Whereupon, at 12:20 p.m., the Committee was adjourned.]

Appendix I

ANSWERS TO POST-HEARING QUESTIONS

ANSWERS TO POST-HEARING QUESTIONS

Responses by The Hon. Ernest Moniz

QUESTIONS FROM CHAIRMAN LAMAR SMITH

- Q1. Our nation's primary goals regarding electricity generation should be the following, in terms of priority: (1) reliability, (2) affordability, and (3) minimizing environmental impact. Do you agree?
- A1. Electricity generation, transmission, distribution and use is a complex, critically important issue for the United States. The attributes that you mention are also critical; I would add security, resiliency and adaptability given the need to modernize the grid for today and tomorrow's world. Across the nation, the priority of each of these attributes will vary, as stakeholders meetings have shown us, and we need to build a system that allows that variability in prioritization. The economic prosperity of the nation will continue to rely on energy as a major part of its foundation and growth. Investment in infrastructure will be necessary for the United States to be successful in the future. Indeed, the Quadrennial Energy Review seeks to balance all of these energy issues by working with states and regions.
- Q1a. Do you believe that government investment in intermittent renewable energy technologies, such as wind and solar power, is the most *efficient* way to achieve these goals?
- A1a. The Federal government has a role in accelerating the development of all clean energy technologies. Efficient use of all resources is an important part of modernizing the grid, and local and state decisions and opinions are critical to achieving modernization. With so many stakeholders, the process of modernization may not be the most efficient but it will be the most democratic.
- Q1b. Can you describe a scenario, in which the United States could reliably get its electricity from only renewable electricity generation? If so, please explain and provide a projected timeline with benchmarks.

- A1b. No one has the answer as to when and if the U.S. could get its energy solely from renewable generation. DOE is working with many states and regions to determine the most balanced path forward. Helping states like Hawaii and California, which are already facing and trying to solve in real time significant issues with renewable energy integration, will provide insight into the broader, longer term options for the nation. This “learn as we go approach” is not optimal, but it is what the populations in those states are asking for. Regionally DOE is working with the Northwest on wind and hydropower integration and across the U.S. with regional scenario planning for each region. This work will take decades to fully realize, and vigilance will be required to help the localities, states, regions and Federal government make the best choices for all concerned.
- Q2. How should the DOE prioritize energy R&D activities to maximize the impact on technology development in the energy sector?
- A2. The Department devotes continual, substantial effort across all of its major R&D programs to understand the technology roadblocks facing industry and the basic science opportunities that could open up new technological opportunities. Hosting of principal investigators meetings and topical workshops, attending major scientific and technical conferences, independent program manager fact-finding, reviewing major independent reports, and extensive internal analysis and deliberations are all aspects of DOE’s approach to understanding the energy R&D landscape. The President’s budget request reflects the energy R&D priorities likely to have the greatest positive impact on DOE’s mission in the near and the long term.

- Q2a. How do you compare and contrast the value of basic and early-stage foundational research to late-stage deployment and commercialization activities?
- A2a. Achieving a portfolio that balances investments in fundamental scientific research, applied research and development, and, where appropriate, selective deployment and commercialization-assistance activities (such as loan guarantees), is the surest path to promoting mission success in the near and long term.
- Q2b. The Obama Administration's FY2015 budget requests a 21.89% increase for the Office of Energy Efficiency and Renewable Energy (EERE). This is an enormous amount of new spending, and these programs are geared more toward near-term commercial applications, as opposed to basic research at universities and national labs. By contrast, the budget request increase for the Office of Science, which funds basic research, is only 0.9%. Are the Office of Science's basic research programs a lower priority for this Administration when compared to EERE? Please explain.
- A2b. The budget request reflects the Administration's priorities. The request provides the resources for the Office of Science to successfully deliver our highest priority investments in research, and in new and upgraded user facilities while continuing to serve today's mission needs.
- Q3. How do you distinguish basic research and applied research?
- A3. The Office of Management and Budget defines basic research, applied research, and development as follows:
- Basic research is systematic study directed toward fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind. Basic research, however, may include activities with broad applications in mind.

Applied research is the systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met.

Development is the systematic application of knowledge or understanding, directed toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

Q3a. What should be the Government's role in each?

A3a. As is affirmed in the 2014 DOE Strategic Plan, the Department has a key role to play in each: "DOE leads the Nation in the transformational research, development, demonstration, and deployment of an extensive range of clean energy and efficiency technologies, supporting the President's Climate Action Plan and an 'all of the above' energy strategy. DOE identifies and promotes advances in fundamental and applied sciences; translates cutting-edge inventions into technological innovations; and accelerates transformational technological advances in energy areas that industry by itself is not likely to undertake because of technical or financial risk."

Q4. The High Energy Physics (HEP) program's mission is to understand how the universe works at its most fundamental level by discovering the elementary constituents of matter and energy, probing the interactions between them, and exploring the basic nature of space and time.

Can you explain the principles guiding the Obama Administration's request that slashes its FY2015 budget by -6.6% compared to FY 2014 levels?

A4. The Department is committed to supporting a robust program in High Energy Physics. The Department has charged the High Energy Physics Advisory Panel (HEPAP) to develop a long range plan describing the exciting science opportunities that face this

field, and to prioritize new projects within realistic budgets. Preparing this plan has been an intensive, community-wide exercise. A final plan is expected at the end of May, and its recommendations will inform future budget requests. As reflected in the FY 2015 budget request, several new initiatives are on hold until this critical advice from the community is received.

Q5. The Science Laboratories Infrastructure (SLI) program mission is to support scientific and technological innovation at the Office of Science laboratories by funding and sustaining mission-ready infrastructure and fostering safe and environmentally responsible operations. The program provides the infrastructure necessary to support world leadership by the Office of Science national laboratories in basic scientific research.

How do you justify a reduction of 19% in the Obama Administration's FY 2015 budget request for SLI, while seeking an increase of 22% for EERE?

A5. At the requested funding level the Science and Laboratories Infrastructure program is able to start four new projects. With the addition of these projects, the FY 2015 budget permits the continuing execution of a portfolio of construction projects that will modernize the Office of Science laboratory facilities. The individual projects were selected to align with current mission needs. Furthermore, the level of investment shows a commitment to improving the condition of the assets and management of the infrastructure across the SC enterprise.

Q6. Secretary Moniz, you testified before this Committee on June 18, 2013 as follows:
 "... the national labs in my view should do more of their business with significant teams focused for an extended time on an important problem. I think that is what the labs can do really uniquely much more easily than a typical university environment."

What have you done thus far in this area and how can we work with you to accomplish this goal?

A6. Together, the 17 DOE laboratories provide the Nation with strategic scientific and technological capabilities. The laboratories:

- Execute long-term government scientific and technological missions, often with complex security, safety, project management, or other operational challenges;
- Develop unique, often multidisciplinary, scientific capabilities beyond the scope of academic and industrial institutions; and
- Develop and sustain critical scientific and technical capabilities to which the government requires assured access.

These functions are not easily replicated in the academic sector, and each of these functions is relevant to tackling our most difficult, long term R&D challenges.

Last year I charged the Secretary of Energy Advisory Board (SEAB) to conduct a study of the Department's newest constructs for funding energy R&D, including the Bioenergy Research Centers and the Energy Innovation Hubs, which bring together large multidisciplinary teams to tackle extremely difficult problems. SEAB released their report on March 28; the report contains a succinct summary of the differences between these research modalities. SEAB affirmed the distinct character of each modality and pointed out each one's strengths and, where applicable, potential shortfalls. SEAB made a number of recommendations regarding management and evaluation of these programs to which I am giving serious consideration, particularly as we consider new ways to utilize our laboratories.

In addition, this past fall I established a National Laboratory Policy Council (LPC), which I chair, and a National Laboratory Operations Board (LOB), chaired by the Under Secretary for Management and Performance, to contribute to an enterprise-wide effort to identify, manage, and resolve issues affecting the strategic guidance, management, operations, and administration of the National Laboratories. The LPC and LOB are comprised of members from senior leadership within the Department and the laboratories. The LPC provides a forum for the National Laboratories to provide strategic advice and assistance to me in the Department's policy and planning processes and for the Department to provide strategic guidance on National Laboratory activities in support of Departmental missions. The objectives of the LOB are to strengthen and enhance the partnership between the Department and National Laboratories, and to improve management and performance to more effectively and efficiently execute the missions of the Department and the National Laboratories.

Q7. What barriers do you see hindering technology transfer at DOE labs and user facilities?

Q7a. How do you intend to eliminate those barriers?

A7. The Department of Energy's seventeen National Laboratories and five research/production facilities have served as the leading institutions for scientific innovation in the United States for more than sixty years. Technology partnering is an active component of their mission, and ensures that their scientific and technological innovations advance the economic, energy, environment, and national security interests of the United States.

While the Department has shown considerable success in transferring technology out of the labs, the Administration is constantly striving to improve its engagement with private industry. Amongst other initiatives, the Department is currently focused on increasing interactions between the labs and industry, ensuring the effectiveness of these collaborative efforts, increasing ease of access to federally developed IP, improving engagement with small businesses, and revisiting how the Department defines and evaluates success in technology transfer.

Q7b. What is the proper role of DOE in facilitating technology transfer?

A7b. The Federal Labs are valuable taxpayer assets at the forefront of basic and applied science, and it is critical that the Department maintains its ability to provide direct oversight of the labs in order to ensure fairness of access and commitment to U.S. industrial competitiveness. The specific responsibilities of the Department of Energy in facilitating technology transfer are largely prescribed in the Stevenson-Wydler Technology Innovation Act of 1980, as amended, the Energy Policy Act of 2005, as amended, and the Department's Management and Operating contracts with the labs.

Q8. Secretary Moniz, you have advocated for "clean" energy. Do you consider electricity generated by nuclear fission to be "clean" in this context?

A8. Yes. Nuclear energy is currently the Nation's largest source of carbon-free electricity. The President's Climate Action Plan notes the importance of driving American leadership in clean energy technologies such as efficient natural gas, nuclear, renewables, and clean coal technology.

- Q9. Secretary Moniz, you have advocated for “renewable” electricity generation. Considering the total amount of proven uranium and thorium deposits on earth and the *potential energy* from reprocessing used nuclear fuel, what technical barriers exist that would prevent you from considering electricity generated by nuclear fission to be “inexhaustible” for the next 1,000 years?
- A9. The Department of Energy has an active research and development program evaluating alternate nuclear fuel cycles. No advanced fuel cycle has reached technology and economic maturity and there are a variety of factors, technical and otherwise that would need to be fully evaluated as part of any future decisions related to this issue. We plan to continue our work on fuel cycle research and development activities.
- Q10. Intermittent renewable energy resources face technological challenges before those resources will be ready on their own to meet the reliability needs of a modern society. Yet nuclear power has proven itself to meet reliability standards, has low fuel costs, and is perhaps the most labor intensive for of electricity generation.
- Q10a. That said, why has this administration not approached nuclear power with the same level of enthusiasm as it has shown for intermittent technologies, such as wind and solar?
- A10a. The Department of Energy (DOE) supports the President’s all-of-the-above energy strategy, and the FY 2015 Budget Request demonstrates the Department’s continued support of both nuclear and renewable energy to meet our energy security and clean energy goals.

To ensure that nuclear energy remains a viable energy option for the Nation, the Office of Nuclear Energy supports research, development, and demonstration activities, if appropriate, which are designed to resolve the technical, cost, safety, waste management, proliferation resistance, and security challenges of increased use of nuclear energy. The Department is funding a small modular reactor licensing technical support program to support first-of-a-kind costs associated with design certification and licensing activities

for SMR designs through cost-shared arrangements with industry partners to help promote commercialization. Also, the Department is sponsoring R&D on more advanced high temperature small modular reactors and material aging issues where research results will help support subsequent license renewal applications expected from industry in the 2016 to 2018 time period.

In addition, DOE's Loan Program Office supports deployment of innovative clean energy technologies, including new nuclear power plants. Recently, the Department finalized a loan guarantee for the new nuclear units being constructed in Georgia by Southern Company.

Q10b. Do you agree that nuclear power (on a per-megawatt basis) creates more permanent jobs than wind or solar?

A10b. The Department believes that both nuclear energy and renewable energy generation can provide substantial economic benefits to our Nation. DOE's work in nuclear and renewable energy parallels fundamental national interests – expanding prosperity, increasing energy affordability, ensuring environmental responsibility, enhancing energy security, and offering all Americans a broader range of energy choices. Both the Office of Nuclear Energy and the Office of Energy Efficiency and Renewable Energy implement a range of strategies aimed at reducing our reliance on foreign oil, saving families and business money, creating jobs, and reducing pollution. Additionally, the Department continues to work to ensure that the clean energy technologies of today and tomorrow are not only invented in America, but also manufactured in America.

Q11. It is well accepted that the Nuclear Regulatory Commission licensing process is likely to delay market adoption of small modular reactors (SMRs). Can you suggest a policy mechanism to accelerate market adoption of SMRS?

- A11. While there are unique physical and process characteristics employed by SMR designs that may be novel for NRC consideration, the Department believes that the SMR technologies are adequately mature for licensing and that the licensing process is not a limiting factor in market adoption. The Department is funding a small modular reactor licensing technical support program focused on first-of-a-kind costs associated with design certification and licensing activities through two cost-shared SMR industry partnerships to help promote commercialization of SMR technologies. Moreover, the Department believes that the market for SMRs remains viable as economic and load-growth conditions are forecast to change as we move into the 2020's and beyond.
- Q12. In January, President Obama announced a Department of Energy sponsored manufacturing innovation institute based in North Carolina for next generation power electronics. Congress has yet to approve legislation supporting these manufacturing institutes.
- Q12a. What was the Department of Energy's (DOE) role in the selection of an institute focused on next generation power electronics and how was this focus area selected?
- A12a. Institute topic areas supported by DOE directly support progress on clean energy manufacturing issues. As stated in the FOA,¹ DOE and EERE are responsible for administering the merit review and selection process, consistent with the Department of Energy Merit Review Guide for Financial Assistance.²
- Potential topic areas for Clean Energy Manufacturing Innovation Institutes are developed in consultation and with input from stakeholders – industry, including small, medium, and large firms and not-for-profit industry associations, as well as the research community and state and local governments -- to determine a topic's suitability for an

¹ "Clean Energy Manufacturing Innovation Institute Funding Opportunity Announcement." Available at: <https://eere-exchange.energy.gov/FileContent.aspx?FileID=d6e47be1-af8d-4e21-a113-8b7cd4a13f1b>.

² "Department of Energy Merit Review Guide for Financial Assistance." Available at: <http://energy.gov/sites/prod/files/meritrev.pdf>.

Institute FOA. Candidate topics will be selected based on the consideration of potential energy, environmental, and economic impacts of technology (including reducing the energy intensity of production and producing items which reduce life cycle energy use); additionality relative to existing public and private sector investments in such facilities; technical uncertainty and risk which limit potential private sector investment; potential for catalyzing influence of public sector investment; and opportunity for long range impact on domestic manufacturing.

Q12b. How was the grantee, North Carolina State University selected?

A12b. All applications were subjected to a rigorous, multi-layer review process in accordance with the evaluation process described in the FOA (DE-FOA-0000683, "Clean Energy Manufacturing Innovation Institute"). Full applications were evaluated against several merit review criteria. The five merit review criteria are individually weighted as a percentage of the total score in the evaluation as indicated below. They include Objectives and Impact to U.S. Manufacturing (Weight: [30%]); Capabilities and Resources (Weight: [30%]); Approach and Management Plan (Weight: [20%]); Intellectual Property (IP) Management Plan (Weight: [10%]); Transition Plan (Weight: [10%]); and other selection factors that the selection official may consider such as U.S. Geographic Diversity, Program Diversity, and High Leveraging of Federal Funds. These criteria and corresponding sub-criteria are listed in the FOA, which is available at: <https://eere-exchange.energy.gov/FileContent.aspx?FileID=d6e47be1-af8d-4e21-a113-8b7cd4a13f1b>.

Q12c. How much funding is DOE committed to provide to the institute and over how many years will it offer support?

A12c. Approximately \$14 million is expected to be available upon initial award, and subject to appropriations, at least an additional \$14 million per year is expected to be made available in the following four years, for a total of up to \$70 million over five years of funding. If sufficient funding is available, DOE is planning to invest \$70 million with a forward-weighted funding profile. DOE funding will be provided on an annual basis and will be contingent upon meeting the agreed upon accomplishments and milestones. Funding for all awards and future budget periods is also contingent upon the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority.

Q12d. Where is the funding for this institute coming from, from what existing DOE authorities?

A12d. Funding for Clean Energy Manufacturing Innovation Institutes is obligated from the Advanced Manufacturing Office Advanced Manufacturing R&D Facilities subprogram. The Advanced Manufacturing Office's current research and development activities are authorized by the following statutes:

- **P.L. 109-58, "Energy Policy Act of 2005," 2005**

The Energy Policy Act of 2005 set forth an energy agenda covering a wide range of energy technology research and implementation activities with provisions applicable to AMO activities.

- **P.L. 110-140, "Energy Independence and Security Act of 2007," 2007**

The Energy Independence and Security Act of 2007 (EISA) set forth an agenda for improving U.S. energy security across the entire economy. Industrial energy efficiency is specifically called out in Title IV.

- **P.L. 102-486, "Energy Policy Act of 1992," 1992**

The Energy Policy Act of 1992 established numerous requirements for industrial efficiency, including those listed under Title I, Subtitle D, and several sections under Title XXI.

- **P.L. 95-91, "U.S. Department of Energy Organization Act," 1977**

This legislation consolidated the Federal Energy Administration and the Energy Research and Development Administration to create the Department of Energy and define its mission.

Q12e. What is the matching requirement for the institute's partners?

A12e. Recipient cost share must be at least 50% of the total allowable costs of the project (the total allowable costs of the project is the sum of the Government share, which includes FFRDC contractor costs if applicable, and the recipient share of allowable costs) and must come from non-federal sources unless otherwise allowed by law. (See 10 CFR Parts 600.123, 600.224, 600.313 and 603.415 for the applicable cost sharing requirements.) The minimum 50% cost share amount applies to both Cooperative Agreements and Technology Investment Agreements.

Q12f. How are other federal agencies involved and supporting this program, including NIST?

A12f. The inter-agency Advanced Manufacturing National Program Office (AMNPO) -- which is hosted by the National Institute of Standards and Technology (NIST) and staffed by representatives from federal agencies with manufacturing-related missions as well as fellows from manufacturing companies and universities -- has led the formation of the National Network for Manufacturing Innovation (NNMI) concept, gathering input from hundreds of

private sector, academic, state government and other stakeholders through a series of public workshops and several formal Requests for Information. Through the creation of Institutes aligned with agency missions and NNMI, the DOE and AMNPO, along with its partner agencies, seek to ensure U.S. prosperity and security to support innovative, advanced manufacturing technologies that will enhance domestic advanced manufacturing competitiveness and create jobs for American workers. As part of NNMI, DOE-led Institutes will contribute to the creation of an effective manufacturing research infrastructure for U.S. industry and academia to develop foundational, high-impact clean energy technologies.

Q12g. How long does DOE anticipate supporting this institute?

A12g. DOE is planning to invest \$70 million in the Institute to be expended over the next 5 years with a forward-weighted funding profile.

Q12h. Are there plans for other DOE sponsored institutes?

A12h. In FY 2014, EERE is currently planning for three Clean Energy Manufacturing Innovation Institutes, including the Next Generation Power Electronics Manufacturing Institute (North Carolina State competitively selected in FY 2014) and the Advanced Composites Manufacturing Innovation Institute (not yet competitively selected). A Request for Information for potential topics for eventual competitive selection of a third Institute was released in April 2014. DOE has also held widely-attended public workshops and public gatherings at various locations across the country as part of the topic identification and selection process, and several National Laboratories have held technology topic meetings with participants from the academic, industry, and manufacturing research communities. The FY 2015 Budget Request for the Advanced

Manufacturing Office supports competitive selection of at least one new Institute and forward-funds the pay-down of commitments to all existing Institutes.

Q12i. Are there concerns that in the way these institutes have been established to date, the federal government is selecting technologies and or industries to be supported and therefore picking winners and losers?

A12i. The NNMI model has received significant stakeholder interest and support, and DOE has solicited stakeholder input on foundational clean energy manufacturing technology areas with strong impact on multiple clean energy technologies that cut across multiple industries for its FOAs through multiple public conferences and workshops, as well as agency Requests for Information.

Potential topic areas for Clean Energy Manufacturing Innovation Institutes are developed in consultation and with input from stakeholders to determine their suitability for an Institute FOA. Candidate topics will be selected based on the consideration of potential energy, environmental, and economic impacts of technology (including reducing the energy intensity of production and producing items which reduce life cycle energy use); additionality relative to existing public and private sector investments in such facilities; technical uncertainty and risk which limit potential private sector investment; potential for catalyzing influence of public sector investment; and opportunity for long range impact on domestic manufacturing. This approach to identification of foundational technology areas for potential Institutes aligns with the policy direction in the President's Council of Advisors on Science and Technology report, "Report to the President on Ensuring Leadership in Advanced Manufacturing," which advocates for support of

innovation policy in contrast to industrial policy. This approach is also consistent with FY 2014 direction from the House Appropriations Subcommittee on Energy and Water Development to target advanced manufacturing research and development activities that support creating manufacturing jobs in the United States.

Q13. In 2012, President Obama signed an executive order to form an interagency working group led by the White House to coordinate and plan agency activities for hydraulic fracturing research. The DOE, EPA, and US Geological Survey committed to developing an interagency research plan. At the time, the Obama Administration agreed to submit to Congress a research plan in January of 2012.

Q13a. What is the reason for the extended delay in producing the interagency plan?

A13a. The development of a multi-agency strategy in a technically complex, rapidly evolving field is a complicated task that takes several iterations. However, the work to date to develop the strategy has been very helpful in both coordinating the research efforts of the three agencies and developing the President's FY2014 and FY 2015 Budget Requests. Ongoing discussion between the agencies, via a Steering Committee and its Technical Subcommittee, to develop the multi-agency strategy, forms the basis for coordination and collaboration.

Q13b. When will the Obama Administration submit the plan to Congress?

A13b. The draft multi-agency strategy is undergoing interagency discussion. The focus of the multi-agency effort is to support the safe and prudent development of our domestic unconventional oil and gas resources. As such, the draft strategy identifies high priority challenges and associated research needs. The work to date to develop the strategy has been very helpful in both coordinating the research efforts of the three agencies and developing the President's FY 2014 and FY 2015 Budget Requests. This research and

development strategy is currently undergoing review by each of the participating agencies.

Q13c. How much funding has the President requested – across all Agencies – for these efforts? Please: 1) outline the total request; 2) detail the Agency by Agency requests that make up this total; 3) explain the specific activities that will be funded; and 4) detail the goals of those initiatives.

A13c. The FY 2015 budget request for the three agencies totals \$48.1 million (\$15.3 million for DOE, \$14.2 million for EPA, and \$18.6 million for USGS). Each agency continues to pursue its ongoing research work to address challenges associated with the safe and prudent development of unconventional oil and natural gas. The Steering Committee is developing a strategy to ensure effective coordination of the work and to define key future directions. Work has been and will be targeted at key research questions detailed in the draft strategy.

Q13d. How does the Administration come up with a budget request without having first come up with a plan of action?

A13d. The Steering Committee's Technical Subcommittee is using the draft strategy to prioritize the research needs and to identify the science and tools that are needed to support sound policy and informed decisions on the development of these unconventional resources in a manner that is environmentally sound and protective of human health and safety. Most research activities involve utilizing the core competencies of the respective agency and planning for these activities requires close coordination among the three agencies. Ongoing discussion between the agencies to develop the strategy has been the basis for most of this coordination. For DOE, coordination has involved highlighting from ongoing or completed projects the key research results or insights that have relevance to the other agencies. Results from

ongoing research are shared with the Steering Committee, add to the body of knowledge, and inform the development of the budget request.

Q13e. Can you speak more generally to what you and the federal government are doing to ensure research undertaken to inform potential regulatory actions is done openly and in a balanced manner?

A13e. The focus of the multi-agency effort is to support the safe and prudent development of our domestic unconventional oil and gas resources. As such, the draft strategy identifies high priority challenges and associated research needs. The Steering Committee's Technical Subcommittee will use this strategy to prioritize the research needs and to identify the science and tools that are needed to support sound policy and informed decisions on the development of these unconventional resources in a manner that is environmentally sound and protective of human health and safety.

The draft strategy will undergo review within the 3 agencies and will also be reviewed in the standard intergovernmental process. When the plan is submitted to Congress it will be available for public review on the web at www.unconventional.energy.gov. In addition, Grants.gov and other public monitoring websites will allow interested parties to explore the external funding available for these efforts.

Q13f. What steps are you taking to ensure that Agencies aren't duplicating efforts of States or other Agencies and thereby wasting tax-payer money in the process?

A13f. DOE, DOI, and EPA have made significant progress on both coordinating individual research projects and collaborating on joint research to avoid duplication of effort among the three Agencies. The Agencies have engaged other Federal partners and stakeholders through a variety of mechanisms. DOE, USGS, and EPA are working to finalize a Strategy document that identifies current and future research needs and highlights projects that are underway and could be undertaken to address these needs.

Q13g. What steps has the Administration taken to ensure that the federal government does not infringe on areas of traditional State and Tribal sovereignty?

A13g. The program is developing a research and development strategy for coordinating and collaborating on activities that address issues associated with the development of unconventional oil and natural gas resources in a manner that is environmentally sound and protective of human health and safety. Information resulting from the research efforts can inform Federal, State, or Tribal government in managing the development of the unconventional oil and gas located in the Federal, State, or Tribal land.

Q14. For the first time ever, the President's budget request included \$25 million to fund carbon capture and sequestration (CCS) projects for natural gas power plants. Likewise, the \$77 million for other carbon capture projects (*see DOE FY 15 Budget Request, vol. 3, p. 551*) requests "support for up to 3 pilot scale projects testing advanced carbon capture technologies from natural gas power systems."

Q14a. Please provide details of these programs and the rationale behind this change in direction.

A14a. I appreciate the opportunity to clarify this request and address any possible confusion from the budget language. To clarify, the \$25 million request in CCS Demonstrations is focused on carbon capture and storage projects for natural gas power plants. The \$77 million request in Carbon Capture includes \$65 million for post-combustion capture and \$12 million for pre-combustion capture. As stated in the Explanation of Changes on pages 555 and 560 of the DOE FY 15 Budget Request, vol. 3, post-combustion capture will continue to pursue advanced technology development, supporting one large-scale slipstream/pilot test (~ 10 MWe) of a second generation technology, continue progress on small pilot-scale tests, and perform R&D for transformational technologies at the laboratory and bench-scale. The funding request continues DOE's support for carbon capture technologies to meet the endpoint goal of \$40/tonne of CO₂ captured and does not represent a change in its program objectives.

Q14b. What is the total request for carbon capture related activities? Please detail 1) the specific fuel type and 2) capture method of each project DOE was previously, is currently, or will be considering involvement with in any capacity. Identify: 3) the specific federal involvement and 4) any federal resources utilized.

A14b. 1) The total request for carbon capture related activities in the Coal Program includes:

- \$25 million in CCS Demonstrations, specifically focused on carbon capture and storage for natural gas applications.
- \$77 million in Carbon Capture for fossil fuel fired plants, with the primary focus on post- and pre-combustion capture for coal-fired power plants. The current projects within Carbon Capture are only focused on coal-fired power plant applications. These include laboratory-, bench-, and small-scale pilot projects. The FY15 request would initiate one large-scale slipstream/pilot test (10+ MWe) of a second generation carbon capture technology for a coal-fired power plant.
- \$15 million in Advanced Combustion Systems supports research and development for oxycombustion and chemical looping technologies for coal-fired applications.

2) Past, present and FY15 requested funding has and will continue to support a variety of technologies. These include advanced solvents, sorbents and membranes, novel equipment and process designs, new designs and concepts for oxycombustion, and chemical looping cycles. Additionally, DOE is also interested in transformational technologies and approaches such as electrochemical separations and non-aqueous and phase change solvents.

3) DOE involvement with these projects is in accordance with DOE and Federal guidelines for procurement and project management. DOE's National Energy Technology Laboratory will participate and have substantive management and technical involvement with these projects.

4) Federal resources utilized for these projects are appropriated funds to conduct the research and development activities and necessary procurement, program, and project management activities.

Q14c. For future projects, what metrics will be used in selecting projects? Has this changed in any way from previous selection criteria?

A14c. As in the past and for FY15, any new projects selected will be based on scientific and technical merit, technical approach, as well as project management planning and execution, including the amount of private cost-shared contribution to maximize the effectiveness of the Federal investment and the likelihood that private investors will pursue the project. The focus of the program is on progressing toward the goal of \$40/tonne capture CO₂. Selections will be made in accordance with DOE and Federal procurement guidelines and practices.

Q15. Earlier this year, the Administration announced that it would conduct a Quadrennial Energy Review to “provide an integrated view of, and recommendations for, federal energy policy in the context of economic, environmental, occupational, security, and health and safety priorities.”

Q15a. What steps have you taken to insulate this review from political pressures and ensure that technical and economic experts are afforded the independence to make frank assessments?

A15. The January 2014 Presidential Memorandum (PM) on the QER stated that the Department of Energy (DOE) and other federal agencies play key roles in energy infrastructure planning and implementation. However, the PM rightly acknowledged that most of the nation’s energy infrastructure is owned by private sector entities and that because of this, the effectiveness of any policy development process was dependent on the active engagement of non-federal stakeholders. For this reason the QER process is

being conducted with as much input from the private sector and other external stakeholders as is practicable, which will lead to greater transparency, accountability, and utility of the QER findings.

In accordance with the PM, DOE has aggressively sought the input and participation of industry, academic, labor, environmental, and think tank experts, most notably in a series of formal public stakeholder meetings which will continue throughout the summer and fall. The goal of the panels and open comment design of the stakeholder meetings is to receive diverse input from experts in energy infrastructure and related fields in their areas of expertise.

In addition to the public stakeholder meetings, DOE will host several technical workshops on issues related to the QER where outside experts from a variety of fields can engage in an open dialogue with DOE staff about the applicability of the work to the QER analyses.

To further elicit input, DOE has created e-mail portals to enable technical experts from across industry sectors and from all disciplines to offer comments and information that will be considered as part of the QER process. These comments will be made public, and all supplementary materials will become part of a virtual QER library to be maintained by DOE, except for those comments that contain business sensitive or proprietary information. These portals (QERcomments@hq.doe.gov, for general comments and materials commenters desire to be made public, and QERconfidential@hq.doe.gov, for

business-sensitive, proprietary, or other materials stakeholders want EPSA to have for analytical purposes, but wish to keep confidential) are up and running, and comments are being reviewed as they come in.

Transparency and accountability are the overarching themes of the QER stakeholder engagement process, and our approach is designed to create a record whereby the public can be assured that the QER recommendations are based on rigorous, data-driven analyses.

QUESTIONS FROM REPRESENTATIVE PAUL BROWN

The DOE Isotope Program has been a supplier of critical isotopes to support U.S. R&D efforts and medical procedures since the 1950s. The GAO issued a report last September, GAO-13-716 Managing Critical Isotopes, highlighting the possible beginning of a shortage of Lithium-7. Lithium-7 is a mundane, yet critical, isotope in the operation of PWR nuclear power reactors. Likewise, Technetium 99m, used extensively in medical imaging, has become more problematic to obtain.

Q1. What steps is the DOE taking in addressing these developing shortages?

A1. The Isotope Program, in cooperation with DOE's Office of Intelligence, Office of Nuclear Energy, and the National Nuclear Security Administration (NNSA), established an internal working group in early 2013 to address lithium-7 (Li-7) management. This working group is taking several actions to mitigate any potential shortage, including reserving a substantial Li-7 inventory, processing the Li-7 for readiness for distribution should the need arise, supporting R&D efforts to develop new Li-7 production techniques, collaborating with industry to demonstrate the feasibility of Li-7 recycling, collaborating with industry to better understand the management of their own inventory of Li-7, and continued monitoring of the Li-7 supply chain. To date, international supply continues to meet the domestic needs for Li-7.

Within DOE, NNSA has the lead in accelerating the domestic supply of molybdenum-99 (Mo-99) and technetium-99m (Tc-99m) produced without the use of highly enriched uranium (HEU). NNSA evaluates and supports commercial projects through cooperative agreements for the development of non-HEU-based Mo-99 production in the United States. The Isotope Program supports NNSA goals by providing technical expertise in reviewing the merit, significance, and accomplishments of its cooperative partners. The American Medical Isotopes Production Act of 2012 (enacted in the National Defense

Authorization Act for FY 2013) calls for annual reviews of the NNSA Mo-99 effort by the Nuclear Science Advisory Committee (NSAC), the Federal advisory committee to the nuclear physics programs within the Office of Science and the National Science Foundation. While not a typical activity for NSAC, the Office of Science charged the NSAC in 2013 to assess NNSA's programmatic goals, strategy, and risks, and to make recommendations to improve NNSA's program effectiveness. The first report was submitted to DOE and NSF in May, 2014 and can be found at <http://science.energy.gov/np/nsac/reports/>.

Q2. The Waste Isolation Pilot Plant, WIPP, in southeastern NM is currently shutdown due to two major incidents in less than two weeks. There was an underground fire, which highlighted a poor safety culture at WIPP, on February 5 and a radiation release which contaminated workers on February 14. It has yet to be determined if the two incidences are related.

Q2a. What is the current status of the Facility?

A2a. As the result of the 2014 events—the February 5th salt haul fire and the February 14th radiological release—the WIPP repository is not accepting any waste shipments. There is no indication at this point that the fire and radiological release incidences are related.

DOE is working to determine the source of the radioactive release, and multiple entries into the underground repository have been completed. The teams continue to take videos and photos and gather technical information that is being analyzed by some of the industry's leading experts as we work toward identifying and mitigating the source of the release.

Q2b. What is being done to address the poor equipment maintenance and adherence to safety rules and procedures?

A2b. Following the 2014 events—the February 5th salt haul fire and the February 14th radiological release—DOE commissioned two Accident Investigation Boards to investigate these issues.

The Board’s vehicle fire and initial radiological release reports have been issued. The Department is currently reviewing safety bases, rules and procedures to develop formal Corrective Action Plans. We recognize the importance of the need for vigilance and efforts to improve safety documentation and adherence to safety requirements. In addition to safety, maintenance requirements, scheduled completion dates and modifications to or new procedures are key parts of the formal Corrective Action Plans currently being developed. Upgrades and/or replacements to facilities, equipment and infrastructure will be made, as necessary, to ensure safe and efficient operations.

Q2c. What is being done to insure the workforce is properly trained on an ongoing basis?

A2c. The Department is currently developing formal Corrective Action Plans in response to the Accident Investigation Boards’ reports. Rigorous training is a key part of all upgrades to existing, or new, programs, systems, processes, operations and equipment. Most of the existing workforce is already qualified in their fundamental job functions, but as a part of implementation of the Corrective Action Plans, improvements will be required in the areas of Radiological Controls, Emergency Management, Engineering, Work Planning and Controls, Maintenance, Procurement, Industrial Safety, Training and Procedures and Project Management. Employees in these affected areas will be trained as part of the corrective actions prior to execution of the work activities. Currently

during the suspension of disposal operations, the WIPP contractor is training employees in the areas of waste operations, underground operations and repository projects.

Q2d. What management adjustments have been made?

A2d. The Department has finalized its federal and contractor recovery teams, which will coordinate efforts to implement corrective actions and allow the site to resume safe disposal operations when appropriate.

Nuclear Waste Partnership (NWP), the management and operating contractor for the Department of Energy (DOE) at the Waste Isolation Pilot Plant (WIPP), named a new NWP President and Project Manager, who has more than 30 years of experience managing some of DOE's largest and most complex sites and has helped these sites recover from operations failures. Additionally, NWP named a recovery manager, who will also serve as deputy project manager. The new recovery manager has more than 28 years of experience in the nuclear safety industry and has a record of accomplishment and expertise in safety, leadership, operations, environmental cleanup, and waste management.

DOE's Office of Environmental Management's newly appointed manager for WIPP recovery activities has more than 25 years of experience in the federal government, serving in various management and technical positions, with a focus on the management of high-level waste, spent nuclear fuel, low-level waste and transuranic waste, systems engineering and analysis, project and contract management, and nuclear operations.

Throughout the recovery process, he will serve as the liaison with the onsite federal and contractor WIPP recovery managers at the Carlsbad Field Office (CBFO).

The onsite senior Federal recovery manager at the Carlsbad Field Office has more than 24 years of service in the federal government, spending the last six years as the Federal project director with the Richland Operations Office in Hanford, Washington. He has extensive technical and project management experience in nuclear and non-nuclear facility design, construction, operation, maintenance and repair, decommissioning, spent nuclear fuel and sludges handling and disposition, and radioactive waste management. The onsite senior Federal recovery manager will report directly to the CBFO manager, while working closely with the EM and Nuclear Waste Partnership (NWP) recovery managers ensuring the safe, timely, and effective resumption of WIPP operations.

- Q2e. What plans are in place to insure that a similar sequence of events doesn't occur at Yucca Mountain when it is in operation?
- A2e. The Administration has determined that Yucca Mountain is not a workable solution and has established a new *Strategy for the Management and Disposal for Used Nuclear Fuel and High Level Radioactive Waste*. DOE will ensure all lessons learned from the WIPP events, response and recovery will be shared with other DOE sites and programs as they undertake work activities consistent with the Strategy.
- Q3. There was a case of research fraud at North Carolina State University which has played out in the scientific journals over several years. Funding for the program was supplied by both NSF and DOE. A FOIA request was made by the complainant, Dr. Stefan Franzen, to DOE which was partially responded to in 2011 asking for the determination of the DOE investigation. The DOE Office of Science has yet to respond.

What action(s) was taken by the Office of Science in its investigation of Dr. Franzen's complaint?

- A3. The Office of Science responded to Dr. Franzen's FOIA request in 2011, and provided him information on its investigation of his complaint. The Department received a FOIA request from the Dr. Franzen dated January 19, 2011, numbered HQ-2011-000484-F, and it was assigned to the Department's Office of Inspector General. On May 18, 2011, the Department's Office of Inspector General provided a response to Dr. Franzen, with responsive documents included within that response, and referral to the Office of Science for a determination on release of another document. On June 10, 2011, the Department's FOIA office provided a final response to Dr. Franzen in response to his FOIA request HQ-2011-000484-F, providing documentation from the Office of Science responsive to Dr. Franzen's request for information regarding its investigation of his complaint.

QUESTIONS FROM REPRESENTATIVE BILL POSEY

- Q1. Can you give us the status on the supply, inventory and availability of Pu-238, and any of nuclear fuel that may be needed for spaceflight?
- A1. The current supply of Pu-238 available for NASA space applications is 35 kilograms of isotope. In addition, the Department of Energy is currently conducting a project, funded by NASA, to re-establish a domestic Pu-238 production capability at an average rate of 1.5 kilograms of Pu-238 oxide per year. This is enough to meet NASA's current assessment of its needs, but the current project approach retains the technical flexibility to increase the production rate, if determined to be necessary should demand increase in the future. The restart project is expected to be completed between 2019 and 2021. NASA continues to fund the development by DOE of space reactor technologies for potential high-power applications, such as planetary surface power and nuclear propulsion.
- Q2. How much Pu-238 do we currently have in stock right now?
- A2. The current supply of Pu-238 available for NASA space applications is 35 kilograms. Of that amount, approximately 17 kilograms meets current specifications, and 18 kilograms can be blended with newly produced material to meet specifications.
- Q3. How much time does it take to produce Pu-238? What are the costs associated with this production?
- A3. The project to re-establish a production capability has been initiated. The current preliminary estimate of the upper bound project cost is \$125 million. DOE expects full production capability between 2019 and 2021. Once we have achieved full production capability, we will produce an average of 1.5 kilograms of plutonium oxide per year.

- Q4. Is a Thorium Reactor currently being employed, or considered, to produce Pu-238 from U-233?
- A4. The Department has structured the Pu-238 production project to rely on mature, established technologies and no use of thorium fueled reactors is planned.
- Q5. Are you aware of any stockpile of U-233 in our national inventory that can produce Pu-238 in a Thorium reactor that is currently being considered for destruction?
- A5. Following a comprehensive assessment completed in 2012, the Department set aside the best quality U-233 for potential future use for criticality safety studies and certified reference materials; however, the vast majority of U-233 has been deemed excess to programmatic needs and is targeted for disposition. There are no plans to use this material to produce Pu-238 in a thorium fueled reactor.

QUESTIONS FROM REPRESENTATIVE CHRIS COLLINS

You have testified that DOE has closed approximately \$6.5 Billion in Nuclear Loan guarantees, roughly \$8 Billion for advanced vehicles, about \$14 Billion for renewables projects, and \$0 for fossil projects.

You also highlighted that currently you have about \$24 Billion additional authority left in the 1703 program and that additional renewables projects could be approved this year. In fact, a status report from the Loan Program Office (LPO) dated March 11, 2013, stated that one of LPO's goals in its 2013 work plan to "close at least one innovative renewable project" and named Cape Wind as that project. That didn't happen last year, but according to your testimony the project is still under consideration. The project provides a good case study.

It doesn't take more than a google search to find out that this offshore wind project has been mired in controversy and litigation for 13 years and was recently remanded to two federal agencies for violation of environmental laws. From my understanding, this project would be funded and built primarily by foreign businesses and would fail to create significant local employment opportunities. Perhaps most troubling, the price tag for the electricity this project would produce would be three times more expensive than other renewable energy in the region.

Q1. Cape Wind's loan application for nearly \$2 billion under the now expired 1705 program was denied. It is currently seeking a loan guarantee under the 1703 program.

Q1a. Please detail the amount of money spent to date in considering this project under these or any other programs at the Department.

Q1b. How much money is the project now seeking from DOE either from this program or others?

Q1c. Are there any other grants, loans, incentives, tax benefits, or federal subsidies that may also provide support for this project?

A1. Under the Recovery Act, our authority to issue loan guarantees under Section 1705 expired on September 30, 2011. Although we were unable to act on the Cape Wind application by that deadline, the application remained in our pipeline under consideration for a loan guarantee under Section 1703. In order to protect the confidential business information of all applicants, the Department does not comment on the status of pending applications, the loan

amounts requested by applicants, or any other non-disclosed federal support applicants may expect to receive (though the applicant has publicly stated that it expects to qualify for the investment tax credit). The Department is required under Title XVII of the Energy Policy Act of 2005 to collect fees from applicants sufficient to reimburse the Department for its administrative expenses in administering the Title XVII program. Currently, those fees include application fees, facility fees at conditional commitment and closing, and project management fees.

- Q2. In selecting the very best projects, how does DOE take into account the relative value and risk to the American taxpayer for all such projects?
- Q2a. Please explain how DOE evaluates the risk profile of this project as it reviews the Cape Wind application. Detail each element that DOE considers in evaluating risk and explain the inclusion of each element. If any potential risk factors are excluded in the evaluation process, explain why.
- Q2b. How does this risk profile compare with other successful projects, unsuccessful projects, and other applicants currently under consideration?
- Q2c. Explain how DOE evaluates overall value of this project for the American taxpayer and energy consumer? Detail each element that DOE considers in evaluating the comparative economic value of potential projects and explain the inclusion of each element. If any economic factors are excluded in the evaluation process, explain why.
- Q2d. Because Cape Wind has struggled for so many years, it faces possible expiration of power contracts or litigation challenging those. How does DOE take this significant revenue risk into account?
- Q2e. Do you believe Congress should establish criteria that will govern the DOE decisions? Should local job creation be a factor? What should and shouldn't be a factor?
- A2. Congress established the criteria the Department uses to administer the Section 1703 loan guarantee program through Title XVII of the Energy Policy Act of 2005. Title XVII directs the Department to issue loan guarantees to eligible projects only if the Secretary determines that there is a reasonable prospect of repayment of the principal and interest on the obligation

by the borrower. In addition, Title XVII requires eligible projects to be located in the U.S., employ an innovative technology, and reduce, avoid, or sequester greenhouse gas emissions.

The Department takes its responsibility to protect taxpayers' interests very seriously. All applications undergo a rigorous due diligence process to ensure that there is a reasonable prospect of repayment and to identify and mitigate or eliminate project risks. This includes due diligence of all relevant credit, financial, legal, regulatory, technical, and other factors. We also have strong portfolio management practices after any loan guarantee is approved to further safeguard taxpayers from the risk of a company being unable to meet its obligations. A report by the General Accounting Office (GAO) found that the LPO's due diligence process was as stringent -- if not more stringent -- than that conducted by commercial lenders. As a result, the project's current portfolio has losses of approximately 2 percent compared to the total value of loans, loan guarantees, and conditional commitments.

- Q3. Even though other offshore wind projects are using larger and more efficient wind turbines, why does LPO consider Cape Wind to be "innovative"?
- Q3a. Please explain in detail.
- Q3b. Why did DOE proclaim a pre-determined outcome if it believes in a rigorous due-diligence process?
- A3. The Section 1703 program is authorized by Title XVII of the Energy Policy Act of 2005 and subject to its final rule (10 CFR PART 609). Under Section 1703, an eligible project must employ a new or significantly improved technology that is not a commercial technology. The rule states that 1) a commercial technology means a technology in general use in the commercial marketplace in the U.S. at the time the term sheet is issued by the Department and 2) a technology is in general use if it has been installed in and is being used in three or more

commercial projects in the U.S. in the same general application as in the proposed project, and has been in operation in each such commercial project for a period of at least five years by the time the term sheet is issued. Currently, there are no offshore wind facilities operating offshore the United States.

The Department has not yet issued a conditional commitment or a loan guarantee to the Cape Wind project. The application is still in due diligence and no determination has been made. No loan guarantee can be issued until due diligence is completed to DOE's satisfaction, a conditional commitment is issued (following a rigorous internal and inter-agency approval process), the conditions to that commitment are met and the Secretary approves the issuance of the guarantee.

- Q4. What assumptions or considerations does DOE make with regard to federal, state, and local regulations in assessing the viability of potential projects?
- Q4a. What federal, state, or local regulatory bodies have the potential to impact the economics of this specific projects.
- Q4b. DOE has indicated it will complete the National Environmental Policy Act (NEPA) analysis and other legal compliance before making a decision. Given that Cape Wind's Environmental Impact Statement (EIS) is now over 5 years old, will DOE prepare a new EIS that will be subject to public comment?
- Q4c. Cape Wind and the Commonwealth of Massachusetts have made it clear the project would use New Bedford, Massachusetts for its staging area, yet all previous federal decisions assumed the use of Quonset, Rhode Island. A change in staging location would require additional review. Will DOE's NEPA review consider these new facts?
- A4. The NEPA EIS prepared by the Department of Interior (DOI) for Cape Wind was adopted by DOE in combination with two Environmental Assessments (EAs) prepared by DOI's Bureau of Ocean Energy Management, the lead Federal agency for NEPA documentation. The EAs were prepared to assess new information and ensure the EIS remains current.

Subject to customary qualifications that may be negotiated, DOE's loan guarantee agreements require borrowers to comply with all applicable federal, state, and local laws throughout the term of the guaranteed loan.

The National Environmental Policy Act (NEPA) requires Federal agencies to consider the potential environmental impacts of their proposed actions. NEPA review must be completed, and current, before a loan guarantee can be issued.

QUESTIONS FROM RANKING MEMBER EDDIE BERNICE JOHNSON

- Q1. Last year the National Academies released a report which found that several inertial fusion concepts have enough technical promise to justify dedicated federal support for inertial fusion R&D relevant to energy, not just weapons reliability. However, there is currently no program in the federal government which directly, officially supports inertial fusion research and technology development activities for energy production purposes. Further, the Administration is again proposing to eliminate all of the activities in the Fusion Energy Sciences Program that could make important contributions to inertial fusion research.
- Q1a. Do you believe that the Department should address the findings of this report? If so, then how does the Administration plan to establish an inertial fusion energy program, or at least allow strong, merit-reviewed proposals for inertial fusion energy research, unrelated to weapons reliability, to be eligible for federal support?
- A1. NNSA conducts an extensive program of experimental research on its ICF facilities, NIF, Z, and Omega, because of the value of the high energy density experiments performed on these facilities to the stockpile stewardship program. Within that scope, research on ignition remains an area of focus. The recent shift in our approach to ignition has provided new physical insights important to stockpile stewardship, including enabling experiments in “burning plasmas”. Until ignition is actually achieved, however, NNSA believes the current approach is consistent with the National Academy report conclusion that an “appropriate time for the establishment of a national, coordinated, broad-based inertial fusion energy program within DOE would be when ignition is achieved.”
- [Conclusion 4-13]
- Q1b. Do you believe that there should be no federal support for other unique inertial fusion energy R&D pathways unless and until the laser fusion approach achieves ignition?

- A1b. As part of the ICF program NNSA is already investigating other approaches to ignition as reported in the 2012 Path Forward on Achieving Ignition report, including polar direct-drive ignition and magnetically-driven ignition. Because ignition is the gateway problem in any approach, NNSA believes that resources should be focused on understanding the physics of ignition, the mechanisms that have impeded successful ignition to date, and scientific approaches to improving ignition.

QUESTIONS FROM REPRESENTATIVE ZOE LOFGREN

Q1. Metcalf Substation Attack

From DOE Report "Large Power Transformers and the U.S. Electric Grid" (June 2012):

- *"In 2010, the average lead time between a customer's LPT (large power transformer) order and the date of delivery ranged from five to 12 months for domestic producers and six to 16 months for producers outside the United States. However, this lead time could extend beyond 20 months and up to five years in extreme cases if the manufacturer has difficulties obtaining any key inputs, such as bushings and other key raw materials, or if considerable new engineering is needed."*
- *"Th[e] world's largest installed base of LPTs is aging. Power equipment manufacturers estimated that the average age of LPTs installed in the United States is approximately 40 years, with 70 percent of LPTs being 25 years or older. According to an industry source, there are some units well over 50 years old and some as old as over 70 years old that still operating in the grid. The same source also noted that these transformers are typically warranted by the manufacturers for approximately 30 to 35 years... The need for LPTs has been growing steadily since 1999. Despite its mounting demand for power transformers, the United States has a limited domestic capacity to produce LPTs."*
 - *"In 2010, only 15 percent of the nation's demand for power transformers (with a capacity rating of 60 MVA and above) was met through domestic production."*

Q1a. Mr. Secretary, as I'm sure you're aware, last April – in fact, it is almost exactly one year ago (*April 16*) – 17 transformers were damaged in a precision attack at the Pacific Gas and Electric (PG&E) Metcalf substation in my district. Fortunately, this attack did not occur during peak season, and power was able to be re-routed and supplied by other plants. It's my understanding that had circumstances been only slightly different, we could have faced major outages and rolling blackouts in Silicon Valley. This would not only have a serious impact not only on my district but on the U.S. economy. I think we need to be more aware of the physical vulnerability of our critical infrastructure to these types of attacks—and I know you've been engaged on that—but, this is also a situation that could be created by severe weather—earthquakes, hurricanes, tornadoes. Given the long lead time in replacing damaged transformers—which I understand is a function of the availability of spare parts, the custom nature of most transformers, and the lack of U.S. manufacturers, could you provide some information about any actions DOE has taken to decrease our reliance on foreign manufacturers for large power transformers? (*A recent WSJ article suggested that the U.S. has only 7 manufacturers; DOE's 2012 report says China had 30 manufacturers in 2010.*)

- A1a. DOE has just published an update in April 2014 to the Large Power Transformers (LPTs) and the U.S. Electric Grid study originally completed in June 2012. The update reports that since 2010 three new manufacturing plants have been built in the U.S. that can produce LPTs. Another existing plant has expanded recently to allow it to also produce LPTs. The report is available here:
<http://www.energy.gov/sites/prod/files/2014/04/f15/LPTStudyUpdate-040914.pdf>

DOE has also supported initiatives to better understand threats and hazards to transformers and identify best practices to protect them or mitigate risk. For example, DOE has provide support for the Energy Infrastructure Security Summits held annually in either the U.K. or the U.S. to share best practices of how to reduce risks to large transformers from geomagnetic disturbances (GMD) and electromagnetic pulse (EMP). This summer's Summit will expand the threats discussed to include physical and cyber threats.

DOE also funded a study last year to examine best practices from 11 different countries to mitigate the threat from GMD.

DOE has successfully encouraged transformer manufacturers to participate on the North American Electric Reliability Corporation (NERC) Geomagnetic Task Force which has been working to respond to a Federal Energy Regulatory Commission (FERC) rule to protect the grid from space weather potentially impacting large transformers.

DOE and the electricity industry encouraged the Department of Homeland Security to fund a recovery transformer project (RecX). RecX is lighter, smaller and easier to transport and quicker to install than a traditional extra high-voltage transformer. The RecX was designed to be an applicable replacement for more than 90% of transformers in its voltage class.

DOE is working with Federal partners to identify the use of existing authorities as it relates to transformer replacement. In the event of a national emergency impacting LPTs, the Defense Production Act Title 1 Priority Ratings could be utilized to speed access to replacement transformers.

- Q1b. Is it possible to have stockpiles of this equipment? If there's currently too much variation, is it possible to pursue standardization and increased interchangeability especially as we replace our aging transformers?
- A1b. Utilities do keep spare transformers in their inventory in case of catastrophic failure, in light of the long lead times to get replacements. DOE continues to work with FERC, NERC, and industry to improve programs such as NERC's Spare Equipment Database System and Edison Electric Institute's Spare Transformer Equipment Program. These nationwide spare programs are intended to identify who in the industry may have a compatible spare if a utility loses one of its LPTs. A spare's usefulness is limited by the uniqueness of most LPT designs, configurations, and footprints.

Pursuing standardization would help reduce the limited interchangeability of most current spares. The challenge in implementing a standardization strategy is that this can work for

new transformers, but for the most part will not work for replacements (which are most of the market for LPTs). Replacements must be uniquely built and configured to work in a specific location. Spares can be produced and designed (like the Rec-X) to be able to replace multiple types of transformers. However, this increases costs significantly, and hence limits the marketability of such a product or design.

- Q2. The Congressional Advisory Panel on Governance of the National Security Enterprise released interim findings. They were quite harsh on the National Nuclear Security Administration, calling it a failed experiment. What steps are you taking to address these concerns, and more pertinent to this committee, what steps can be taken to prevent these failings from being duplicated at Office of Science facilities, and vice-versa, what lessons can be learned from the more functional relationship Office of Science labs seem to have with DOE?
- A2. Since I became Secretary last May I have sought to implement a number of enterprise-wide reforms, as well as to address specific challenges confronting NNSA. In consultation with the Congress I created the Undersecretary for Science & Energy and the newly created Undersecretary for Management and Performance (U/S M&P), which will enhance mission alignment and function. The U/S M&P will increase attention given to large capital projects and relieve the Under Secretary for Nuclear Security of oversight of EM programs. I have also revamped the organization of security across the department – including within NNSA – to enhance clarity of authority and accountability. In addition, we have reorganized the environment, safety and health and independent oversight functions. I want to bring new rigor to assessing costs and performance and ensuring design maturity for projects – many of which are one of a kind or technically complex. As applicable, it is of interest to build on the project management success

within the Office of Science. These enterprise-wide changes will benefit the Department as a whole, including NNSA.

